THE IRON TRADE REVIEW

VOLUME XXXV CLEVELAND, OHIO, SEPTEMBER 18, 1902 NUMBER 38

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

More complete dominance of the market for prompt pig iron by imports and further softening in steel billets because of low offers on foreign material, are features of the iron market the past week. The situation in domestic pig iron is still controlled by short coke supply; and furnacemen have come to the conclusion that the trade will drift on into the season of snow blockades and of short output due to freezing weather, with no change for the better but rather for the worse. It was in November, 1901, that the shortage of locomotives and cars began to affect the price of iron and steel. With the exception of brief intervals in the spring of 1902 this has been the most important influence at work since. Just now production of pig iron holds substantially at the rate of the past two months—an active furnace capacity of 335,189 tons a week on Sept. 1, or at the rate of less than 17,500,000 tons a year. Stocks remained practically stationary in August, indicating that scattered lots of off iron are now all that remain in furnace yards. Foundries are getting relief by the use of Scotch and English irons and shipments of Dominion Iron & Steel Co. foundry iron to the Central West have begun. A very large proportion of the output of Northern and Southern furnaces has now been sold for the first half. One Southern furnace re-opened its books for business for the first half of 1903 in the past week and booked No. 2 foundry iron on the basis of $21 Birmingham, or $3 a ton above contract business of three weeks ago. Some English Bessemer iron has been imported for Pittsburg at $21.50 to $22 delivered, but it is stated that the United States Steel Corporation does not expect to buy Bessemer iron abroad to make good the assured shortages of merchant furnaces on their contracts with it running through this year. Some German basic iron, with its high phosphorus content, has been imported, sales in Pittsburg being now at $22.25, or an advance of 50 cents in the past week. There is also reported a sale of 30,000 tons of Cleveland district (England) iron to a large producer of cast iron pipe in the United States, the bulk of this iron to be sent to Southern plants via Southern seaports. The steel market is weaker and importations are affecting the price of domestic material, aided by the lessened consumption of steel at home in view of the state of the tin plate, sheet and wire trades. German Bessemer billets are sold at $26.50 delivered at Atlantic seaboard, and as low as $28 Pittsburg is reported. A sale of 10,000 tons has been made to a Western interest. A large Pittsburg producer is increasing its Bessemer capacity by 800 tons a day to overtake its finishing capacity. Indications are that the spread between Bessemer iron and Bessemer steel will be gradually reduced. The heavy materials in finished lines continue strong under steady sales. For delivery this year plates bring about $5 above the pool price and smaller premiums for delivery in the first two months of 1903. Recent shipbuilding orders at Cleveland have taken up 14,000 tons of plates and shapes in Cleveland and bridge works are buying for delivery next year, much of it after July 1. In the Chicago market structural steel has been in active demand. A rail inquiry for 50,000 tons for a Western road, that could not be taken care of in Chicago will probably go to an Eastern mill. The report of a British rail combine taking in eight companies is cabled without official confirmation. German rail mills have been underbidding British mills about $1.75 a ton on recent business and Belgian mills are close competitors with Germany for rail business in the United States and Canada on which mills in this country could not make required deliveries.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Sept. 17.

Extensive purchases of foreign pig iron and billets have been made during the past week and the indications are that until the end of the year the purchases of foreign material will be heavier than during the early months of this year. While large tonnages of foreign Bessemer iron are being negotiated for, only a small lot, amounting to 12,000 tons has thus far been placed. Negotiations for a much heavier tonnage are still pending, however, and will doubtless be closed within a few weeks. A sale of 30,000 tons of Cleveland (England) iron is reported, the purchaser being a large cast iron pipe concern. The iron is for delivery the remainder of this year and the first quarter of next year. A small tonnage of this iron will find its way into this district, but the greater portion will be distributed among the company's Southern plants and will be shipped to Southern ports, which will secure somewhat lower freight rates than shipment to either Philadelphia or Baltimore. A large independent wire concern located west of here has also purchased 10,000 tons of German billets for delivery the first quarter of next year. The inquiries for all kinds of material from this side have stimulated both the English and German markets and have kept prices in both from marked declines. English Bessemer has advanced as the result of inquiries from this side.

While we noted last week a slight relief in the coke situation there has been no noticeable betterment during the past five or six days and four or five furnaces in the two Valleys are banked at the present time. It is the general belief now in iron and steel circles that conditions will remain practically unchanged until the cold weather sets in, when they will grow worse and only sufficient coke will be secured to operate the furnaces four or five days a week—a repetition of the experience of last winter.

The foundry pig iron situation has been somewhat relieved by the large offerings of Canadian iron, as noted in these columns last week, and as several thousand tons of this iron will be disposed of monthly in this country the problem of prompt foundry irons has been largely solved. We have been advised that five foundry furnaces selling the bulk of their output in this district and located in the western section of this state and in Ohio are out of the market entirely for the first half of next year.

The coke situation grows no better, carload lots of foundry coke for prompt shipment having been sold during the past few days at $7 and $8 per ton at the ovens. Consumers are offering these prices to secure the product and as the tonnage asked for far exceeds the available supply the closing down of foundries in various sections of the country, especially the west, must certainly follow. This scarcity of both furnace and foundry coke exists despite the fact that the production of the Connellsville region continues to exceed all previous records.

To provide steel for additional finishing capacity, the Jones & Laughlin Steel Co. is installing an additional Bessemer converter which will have a daily output of about 800 tons. This will increase the company's output of Bessemer steel to about 900,000 tons annually and with the recent additions in open-hearth capacity the annual output of steel will reach 1,200,000 tons. As the company's furnace capacity is not nearly large enough to supply all the pig iron required no less than two large stacks will be needed to make up the deficiency. Nothing along this line has yet been decided upon, however.

PIG IRON.—With domestic Bessemer and foundry irons practically unobtainable, interest centers in foreign pig iron offerings. Canadian foundry iron for early delivery is being of-

fered here at $23 per ton for No. 2 and some small sales are being recorded. Practically no English foundry irons are being sold here, although there are extensive offerings. Local independent steel interests have purchased 12,000 tons of English Bessemer iron for delivery the remainder of the year at prices ranging from $21.50 to $22, Pittsburg. German basic iron has advanced as the result of inquiries from this country to $22.25, Pittsburg, although the prices quoted last week were fully 50 cents below this price. Domestic Bessemer for delivery the remainder of the year is almost unobtainable. Some iron is in the hands of brokers, but as the furnaces in the Valleys are so far behind on their deliveries it is extremely doubtful if this iron will be produced during the last quarter. The pig iron committee of the United States Steel Corporation purchased very little iron at its meeting last week, although the offerings of basic iron were very large. While it has been reported that the corporation is short of Bessemer iron it is reported that foreign purchases will not be made. We make the following quotations:

Bessemer, Valley	$21 00 to 22 00
Bessemer, Pittsburg	21 75 to 22 75
No. 1 Foundry	23 25 to 23 75
No. 2 Foundry	22 25 to 23 25
No. 3 Foundry	21 75 to 22 25
Gray Forge, Pittsburg	21 50 to 21 75
Chilled Basic, Valley	20 75 to 21 00
Chilled Basic, Pittsburg	21 50 to 21 75

STEEL.—There is little doing in the domestic steel market, no transactions whatever having been reported, but the feeling is weaker in Bessemer, owing to the light demand from tin plate and sheet mills. Billets continue to be offered at $31.50 to $32, Pittsburg, with no takers. We note the sale of 10,000 tons of German billets for delivery west of here, during the first quarter of next year, but the delivery price was unobtainable. German billets can now be had at $28, Pittsburg, and sheet bars are held at $29 to $29.50. Wire rods are quoted at $35.50 to $36.

FERRO-MANGANESE.—Quotations on domestic manganese are nominal at $52.50, delivered at buyer's mill. German ferro is held at $51.25 to $51.50, delivered anywhere in the United States.

SPELTER.—There has been no change in the spelter market during the week, prime western grades continuing to be held at 5.35c to 5.37½c, Pittsburg.

MUCK BAR.—The market remains firm at $35.50 to $36 per ton, but transactions during the past few days were limited to small lots only.

SKELP.—Both grooved and sheared iron skelp is held at 2.10c to 2.12½c, while steel is held at 2.15c.

RAILS AND TRACK MATERIAL.—A number of large contracts are pending for delivery in 1903. Quotations are as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $46; 12 pounds, $44; 16 pounds, $42; 20 pounds, $40; 25 to 40 pounds, $38 to $40. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

BARS.—The steel bar mills are beginning to catch up on their specifications and better deliveries can now be secured than at any time this year. Prices remain unchanged as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.80c to 1.90c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2.25c and upwards.

PLATES.—There is practically no change in the situation, none of the mills being in position to take orders on any considerable tonnage before the month of February. On small lots for this delivery 1.85c is asked, while for delivery the remainder of next year the following agreement quotations obtain: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plate more than 100 inches wide, 5c extra 100 pounds. Plate 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

STRUCTURAL MATERIAL.—The situation remain practically unchanged, few of the mills being in position to make deliveries on large tonnages until after the first quarter of next year. Small lots are selling at prices ranging from 2.25c to 2.50c, immediate delivery being specified. Agreed quotations on next year's deliveries are as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

PIPES AND TUBES.—The market holds up exceedingly strong, especially on the larger sizes of pipe. On the smaller sizes it is reported that some of the independent mills are shading quotations to secure business. Quotations to jobbers in carload lots, with freight added to destination, are as follows:

MERCHANT PIPE.

	Black Percent.	Galv. Percent.
⅛ to ½ and 11 to 12 inches	69	48
¼ to 12 inches	67	55

BOILER TUBES.

Steel.

	Percent.
1 to 1½ inches	45
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	42½
2¼ to 5 inches	50
1¾ to 2¼ and 6 to 13 inches	40

CASING.

	S. and S. Percent.
2 to 3 inches	58
3¼ to 4 inches	60
4¼ to 12½ inches	63

SHEETS.—The demand for the lighter gauges of sheets continues to grow better and the fall trade is exceedingly good, as was anticipated. The demand for heavy sheets continues strong and prices are firmly maintained. Quotations in small lots from jobbers are as follows: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets, in carload lots to consumers, are quoted at 3.05c for Nos. 10 and 11, 3.45c for Nos. 18 to 21, 4.20c for No. 27, and 4.50c for No. 28. Galvanized sheets, mill shipments in carload lots to consumers are as follows: Nos. 10 and 11, 3.05c; Nos. 12 to 14, 3.15c; Nos. 15 to 17, 3.25c; Nos. 18 to 21, 3.45c; Nos. 22 to 24, 3.75c; Nos. 25 and 26, 4c; No. 27, 4.25c; No. 28, 4.50c.

WIRE AND WIRE NAILS.—Jobbers report a good demand for wire products. The cut nail market is also reported strong, some of the manufacturers favoring a slight advance at the next monthly meeting. We make the following quotations: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire, $2.40 in carload lots; polished staples, $2.20, and galvanized staples, $2.60; painted barb wire, $2.60, and galvanized, $2.90. These prices are quoted on a Pittsburg base plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—The next quarterly meeting of the shafting manufacturers will be held at Lake George, New York, on Wednesday, October 8. No change in prices is anticipated. We quote as follows: Turned cold rolled ground shafting in carload lots, 47 off, and in less than carload lots, 42 off; tire steel, 2.25c to 2.30c; toe calk, 2.35c to 2.45c; sleigh shoes, 2.25c to 2.35c; machinery steel, 1.70c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

OLD MATERIAL.—There is little activity, consumers holding off, until lower prices shall obtain. We make the following quotations, gross tons: Heavy melting stock, $21.50 to $22; low phosphorus melting stock, $24 to $24.50; steel rails, $21.50 to $22; re-rolling rails, $23 to $23.50; No. 1 cast scrap, $19 to $19.50; borings and turnings, $10.50 to $11.

COKE.—Prices heretofore unheard of in the coke trade, are now being paid to secure prompt shipment of both furnace and foundry grades. Carload lots of foundry coke are selling at $7 to $8 per ton at the ovens, and even at these prices the coke manufacturers cannot begin to meet the demands. Furnace coke in carload lots easily commands $5 per ton. In view of these high prices, and owing to the scarcity of coke which will

continue well into next year, the coke producers are refusing all offers on contracts for 1903. Some are in favor of fixing furnace coke at $3 at the ovens and foundry coke at $3.50 and it is probable that when contracts are closed, these prices or even higher will be named. For the week ending Saturday, Sept. 6, the production of the Connellsville region reached 254,951 tons and this with the production of the lower region brought the total up to nearly 300,000 tons.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, Sept. 16

Local interest still centers chiefly in the coke situation, which is unimproved. One local furnace and three in Wisconsin are reported to have banked last week for lack of fuel, and the prospects are that another local furnace will go out of blast this week. Several furnaces in the South are operating only part of the time, greatly decreasing the output of contract iron. The price of coke for spot delivery has gone soaring upwards during the past week, sales being reported at as high as $14. Much attention is now being given to the future car supply by shippers, who fear a pronounced shortage in this direction with the resumption of work in the striking coal fields. The resources of the railroads will be taxed to the limit in handling the enormous corn crop of this year, and with the increased demand for cars that will come as soon as the coal mines are working full handed, apprehension is felt that there will not be enough cars for the ordinary business needs of the country. Some manufacturers are already calling attention to this fact and are urging their customers to increase their stocks while there is yet a chance.

In the pig iron market, prices are as feverish as they have been for several weeks. Transactions are confined largely to spot iron, for which there is an insistent demand. Some local iron is still being offered for delivery in the second quarter of next year, and during the week an Alabama furnace which had not sold any of its product for delivery in 1903 opened its books, accepting orders on the basis of $21 Birmingham for No. 2 for delivery in the first three months, and $20.50 for delivery in the second quarter. In finished material, conditions remain practically unchanged. There is little demand for bar iron, and though the nominal quotation is 1.95c, concessions are made on desirable business. Scrap has taken on a firmer tone and prices have advanced on several grades. An inquiry for 50,000 tons of heavy rails from a Denver railroad has been withdrawn, leaving orders still pending for about 25,000 tons. There have been several good sized contracts for structural steel let during the week, the sales aggregating three or four thousand tons. A local importer of foreign material, reports the sale several days ago of 10,000 tons of German basic Bessemer billets at $30.75 f. o. b. Chicago. Light plates are active, and there is also a good demand for sheets of heavy gauges.

PIG IRON.—The partial operation of many furnaces, both Northern and Southern, from lack of fuel, has thrown a large number of melters in the market for spot iron, and transactions of this kind largely predominate in this city. While the number seeking iron for immediate delivery grows each week, the tonnage available is taking a backward course, with the result that prices change almost daily. Some sales were made last week at $29 delivered at the foundry, though spot iron is generally held at $27.65 to $28.15 for No. 1 foundry, and 50 cents less for No. 2 foundry. However, no price is a criterion for future sales, each transaction remaining a law unto itself. During the week, an Alabama furnace opened its books for 1903, and is selling iron on the basis of $21 Birmingham for No. 2 foundry, delivery in the first three months, and $20.50 for delivery in the second quarter. Several good sized orders have been taken by this furnace, among them being two or three of 1,000 tons each, deliveries extending through the six months, and a number of smaller orders of varying amounts. Foreign iron is coming into this section in larger quantities, the sales including two lots of Scotch iron of 1,000 tons each and many smaller lots. The cost of this iron advances with that of domestic make for spot delivery, and it is now quoted at $27 to $28. One local and three nearby furnaces are reported to have banked during the week for lack of coke, and another local furnace is expected to go out of blast this week unless it receives a larger supply of coke than arrived during the week closed. The 50-cent increase in the freight rate from Southern points went into effect yesterday, making the freight rate from Birmingham to Chicago $4.15. The following quotations which are for next year's delivery, while not asked by all the sellers that still have iron to offer, are within 50 cents of the market:

Lake Superior Charcoal	$27 00 to 28 00
Local Coke Foundry No. 1	24 00 to 25 00
Local Coke Foundry No. 2	23 75 to 24 25
Local Coke Foundry No. 3	23 25 to 23 75
Local Scotch Foundry No. 1	23 50 to 24 50
Local Scotch Foundry No. 2	23 00 to 24 00
Southern Coke No. 1	23 65 to 24 15
Southern Coke No. 2	23 15 to 23 65
Southern Coke No. 3	22 65 to 23 15
Southern Coke No. 4	22 15 to 22 65
Southern No. 1, soft	23 65 to 24 15
Southern No. 2, soft	23 15 to 23 65
Southern Gray Forge	21 15 to 21 65
Southern Silveries	24 15 to 24 65
Jackson Co. Silveries	20 00 to 20 00
Ohio Strong Softeners	25 60 to 26 10
Alabama Car Wheel	27 15 to 27 65
Malleable Bessemer	25 00 to 26 00

BARS.—Little new business is coming to the front, though specifications are large and active. Most of the mills are holding the price of iron bars at 1.95c, though reports are current that concessions are made on desirable business. We quote Chicago delivery: Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c; iron, 1.95c; hoops, 2.15c. Prices for prompt delivery and out of store, steel, 2c to 2.10c; iron, 2.20c to 2.25c; hoops, 2.50c to 2.60c; angles, 2.50c to 2.60c.

SHEETS.—There is little demand for either light or galvanized sheets, most of the consumers having stocked up on these materials early in the spring. Heavy sheets, however, are active, and both jobbers and mills report that the demand exceeds the supply. We quote No. 27 black, Chicago delivery, 3.15c to 3.25c; galvanized, 4.10c to 4.20c; out of store, No. 27 black, 3.20c to 3.30c; galvanized, 4.35c to 4.50c.

STRUCTURAL MATERIAL.—Several large contracts were let during the week, sales aggregating 3,000 or 4,000 tons. The contract for the new building to be erected by the dry goods firm of Schlesinger & Mayer, requiring about 3,000 tons has been let; also that for a new theater to be erected in this city, requiring about 1,000 tons. Several other large orders are pending. Store trade is active, principally in carload lots. We quote mill prices as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c. Prices on lots from store vary from 2½ cents to 4 cents a pound, according to the size of order and delivery required.

BILLETS.—A local importer of foreign material, reports the sale several days ago of 10,000 tons of German basic Bessemer billets at $30.75 f. o. b. Chicago. Domestic open-hearth forging billets are held at $38 to $40. A few small sales are reported at this price.

RAILS AND TRACK SUPPLIES.—An inquiry for 50,000 tons of heavy rails which was made by a Denver railroad has been withdrawn from this market, and it is believed placed in the East. There are still orders pending from other roads, aggregating 25,000 tons. Light rails are in good demand, the local manufacturers being able to give delivery on this material in the last two months of this year. Track supplies are active in sympathy with the rail demand. We quote heavy sections, $28; second quality, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41, with regular differentials for intermediate sizes; light rails out of store, $45 to $50; track supplies, mill shipments, as follows: angle bars for standard rails, 1.90c to 2c; spikes, 2.25c to 2.50c; track bolts 3½x¾, with square nuts, 2.85c to 3.10c per 100 pounds; with hexagon nuts, 3.05c to 3.20c, with usual differentials for other sizes.

MERCHANT STEEL.—Several orders of a few hundred tons each for extended deliveries have been taken by the local office of an Eastern mill. Sales of small lots from store are fairly active. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.65c to 2.75c; sleigh shoe, 1.75c to 1.80c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher; cold rolled shafting, carload lots, 47 percent

off, Chicago; less than carload lots, 42 percent off, Chicago.

CAST IRON PIPE.—Demand is somewhat modified, confining itself to orders for small lots. Prices are firm. We quote 4-inch water pipe, Chicago, $36; 6-inch and larger, $36; gas pipe, $1 a ton higher.

MERCHANT PIPE.—There is a fair demand, prices remaining steady at the following quotations:

MERCHANT PIPE, RANDOM LENGTHS.
(Jobbers, Chicago Basing Discounts.)

	Black Percent.	Galv. Percent.
⅛ to ½ in. inclusive	58½	46½
¾ to 12 in. inclusive	65½	53½
(Consumers, Chicago Basing Discounts.)		
⅛ to ½ in. inclusive	56½	43½
¾ to 12 in. inclusive	63½	50½

BOILER TUBES.
Steel.

	Percent.
1 to 1½ in.	35
1¾ to 2½ in.	45
2¾ to 5 in.	55
6 to 13 in.	47½

Iron.

	Percent.
1 to 1½ in.	35
1¾ to 2½ in.	32½
2¾ to 5 in.	42½

PLATES.—Independent mills and jobbers, in position to give prompt delivery, report an active demand for plates, particularly of the lighter gauges. Mills are asking 2c for tank steel for quick delivery, and an advance is contemplated this week by jobbers. We quote mill prices for future shipment, Chicago delivery: Tank steel, ¼-inch and heavier, 1.75c to 2.15c; flange steel, 1.85c to 2.25c; from stock, tank steel, ¼-inch and heavier, 2.25c to 2.50c; 3-16, 2.35c to 2.60c; No. 8, 2.40c to 2.65c; flange steel, 2.50c to 2.60c.

WIRE AND WIRE NAILS.—Outside of the demand for fencing, inquiry for wire products is only moderate. Prices are held firmly at the following quotations: To jobbers, smooth wire, carload lots, $2.10; painted barb wire, $2.75; galvanized barb wire, $3; wire nails, $2.15; staples, $2.25. Jobbers' prices to retailers are 5 cents higher than above.

COKE.—There is no change in the local situation. Sales of spot coke have been made during the week from $8 to $14. Many sellers are prone to believe that the highest level has been reached, and that from now on values will gradually recede. Many furnaces and foundries, however, are still suffering keenly from the scarcity and it will take some time to supply all the needs after the ovens are operated to their full capacity.

OLD MATERIAL.—Scrap iron of all kinds has assumed a firmer tone in the past week than for several weeks. Some large sales have been made to rolling mills, and, generally speaking, the situation, locally is much improved. Cast scrap is exceedingly strong in sympathy with the pig iron market. The following quotations are on gross tons:

Old Iron Rails	$24 50 to 25 00
Old Steel Rails (mixed lengths)	19 00 to 19 50
Old Steel Rails (long lengths)	23 50 to 24 00
Relaying rails	31 00 to 32 50
Old wheels	20 50 to 21 00
Heavy melting steel	17 50 to 18 00
Mixed country steel	15 50 to 16 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$21 00 to 21 50
No. 2 R. R. wrought	19 50 to 20 00
Shafting	20 00 to 21 00
Dealers' forge	17 00 to 18 00
No. 1 busheling	15 50 to 16 00
No. 1 Machine Cast	18 00 to 18 50
Railroad Cast	17 00 to 17 50
Railway malleable	16 50 to 17 00
Country malleable	15 50 to 16 00
Iron axles	24 50 to 25 00
Steel axles	21 00 to 21 50
Cast borings	10 50 to 11 00
Wrought turnings	14 50 to 15 00
Iron axle turnings	15 00 to 15 50
Steel axle turnings	14 50 to 15 00
Stove plates	12 00 to 12 50
Old iron splice bars	21 00 to 21 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Sept. 17.

Shipments of iron ore from the upper lake ports for the first half of September are apparently about as large as for the last two weeks of August and it seems certain that the total shipment for this month will far exceed that of September of last year. This is true in spite of the fact that docks are badly crowded and delays in discharging cargoes are frequent. Very little ore is being sold, some dealers reporting that the coke shortage, in lessening the demand for ore at the furnaces has prevented purchases which there was every reason to believe would have been made, had furnaces been running up to their limit.

PIG IRON.—A number of sales of Scotch and Canadian iron have been made in Cleveland during the week, but all were small lots. Foundrymen are exceedingly cautious about buying iron with which they have never worked and reports from the East, where foreign iron is being used, are not entirely reassuring, as castings are not always satisfactory. Buying in small quantities will continue, present negotiations indicate, and deliveries will begin in a couple of weeks. Experiments will then be made and upon the results will depend the future extent of purchases. Agents who are dealing exclusively in domestic iron are not alarmed by the prospects of foreign iron being used. They predict that it will not be found satisfactory and say the only danger is that it may fall into the hands of brokers and ultimately tend to demoralize the market. The coke situation does not improve and from interrupted operations furnaces are from a month to six months behind in their deliveries. The Genesee furnace at Charlotte, N. Y., whose product will be sold through Corrigan, McKinney & Co., was blown in this week. We quote prices as follows, the figures on foundry iron being for shipment in the first half of 1903:

Bessemer	$22 25 to 22 75
No. 1 Strong Foundry	23 00 to 23 50
No. 2 Strong Foundry	22 50 to 23 00
No. 2 Foundry	21 75 to 22 25
Scotch No. 1	23 00 to 23 50
Scotch No. 2	22 50 to 23 00
Gray forge, Valley	20 50 to 20 75
Lake Superior Charcoal	25 00 to 26 00

FINISHED MATERIAL.—With the exception of sheets, the market in finished material is as strong as ever. Six thousand tons of plates were sold this week for ships and this sale with others for plates and structural material, makes a total of 14,000 tons sold within ten days to shipbuilders. An erecting concern is figuring on 3,000 tons of structural material and there have also been inquiries from bridge companies for round lots. The pool price for tank steel is 1.70c without guaranty for delivery, but the price for reasonably prompt delivery is from 2c to 2.25c, the higher prices being for the larger widths. The base price for bar iron is maintained at 1.80c, Pittsburg, and sales are being made at that price with fair demand from small buyers. Sales out of store, Cleveland, are at the rate of 2c for iron and 1.90c to 2c for steel, while large rounds bring from 2.10c to 2.25c. We quote steel bars at 1.60c for Bessemer and 1.70c for open-hearth, Pittsburg. The condition of the sheet market is still unsatisfactory. Independent mills are cutting prices and getting business and there is a feeling that prices which have prevailed for some time are too high in proportion to those of other finished material. It is considered probable that there will soon be sharp competition between the leading producers of sheets and other mills. We quote 2.10c to 2.15c Cleveland for 3-16 inch sheets and heavier. Cleveland prices are on the following basis on mill sales of black sheets: No. 24, 2.90c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c; and the following prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3c; No. 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 22-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c, for one pass cold rolled. On galvanized sheets Cleveland prices to consumers are as follows for carload lots: Nos. 10 and 11, 3.15c; Nos. 12 to 14, 3.25c; Nos. 18 to 21, 3.55c; Nos. 22 to 24, 3.85c; No. 27, 4.53c; No. 28, 4.60c.

OLD MATERIAL.—There is a brisk demand for cast scrap on account of the trouble foundries are having in getting iron. Prices have advanced and dealers look for this to go further. Very little is in the market even at the higher prices. There is only a limited market in Cleveland for heavy steel and at present consumers have a large supply on hand. We quote Cleveland prices, all gross tons, as follows:

Old iron rails	$25 50 to 26 50
Old steel rails (over 6 ft.)	22 00 to 23 00
Old steel rails (6 ft. and under)	21 00 to 22 00
Old car wheels	20 00 to 21 00
No. 1 R. R. wrought scrap	22 00 to 23 00
Mill scrap	19 50 to 20 50
No. 1 machine cast scrap	19 00 to 20 00
Iron axles	28 00 to 29 00
Steel axles	27 00 to 28 00
Axle turnings	18 00 to 18 50
Wrought turnings (free from cast)	16 00 to 16 50
Cast borings	11 00 to 11 50

Uncut wrought iron boilers	12 00 to 13 00
Steel boiler plates	17 00 to 18 00
Grate bars	12 00 to 13 00
Pipes and flues (clean)	17 50 to 18 50
Tank iron	17 00 to 18 00
Hoop and band iron	13 50 to 14 50
Sheet iron	11 50 to 12 00
Wrought drillings	15 00 to 16 00
Malleable iron (railroad)	20 00 to 20 50
Malleable iron (agricultural)	17 50 to 18 00
Stove plate	13 00 to 14 00
Heavy steel	18 50 to 19 50

CINCINNATI.

Sept. 16.

The coke situation is the most aggravating feature in the iron industry. To make the matter worse, relief does not appear to be in sight. The price has advanced to abnormal figures. One sale the past week was made at $8 per ton f. o. b., but there is great scarcity and offerings are not available. Aside from the coke scarcity the situation continues about the same in the trade. In a general way the demand shows no material change. Finished material in the heavier forms is well sold ahead and there is still a good inquiry. Old material rules firm and higher. Prices for pig iron show no change.

PIG IRON.—The tonnage booked the past week was fair but not large. The trade was just a little quiet. Sales are still mainly for delivery the first half of next year. The transactions were to a large extent in soft foundry iron. The market is reported as a little heavy on hard iron. The offerings however are not being pressed and holders are not talking lower prices. Some gray forge offered recently for spot delivery found buyers' ideas about $18.50 to $19.00 per ton. Very little spot No. 2 foundry is to be had. It is nominally $25.25 to $26.25. Foreign iron is becoming more of a feature in sales in the Central West. Some sales during the week have been made for October and November delivery. It is though that foreign iron will be selling in this territory for some months to come, owing to the continued interruptions in the production of Northern irons. Prices are well maintained on the desirable grades but are not quotably higher although some grades have been marked up by dealers of importance. Prices f. o. b. Cincinnati for delivery after January 1, are as follows:

Southern Foundry No. 1	$22 75 to 23 50
Southern Foundry No. 2	22 25 to 22 75
Southern Foundry No. 3	21 25 to 22 00
Southern Foundry No. 4	20 75 to 21 50
Southern Foundry No. 1, soft	22 75 to 23 50
Southern Foundry No. 2, soft	22 25 to 22 75
Gray Forge	20 00 to 21 00
Northern Foundry No. 1	26 10 to 26 60
Northern Foundry No. 2	25 10 to 26 10
Southern car wheel iron	27 50 to 28 50
Malleable coke iron	25 00 to 25 75

FINISHED MATERIAL.—The demand continues strong and the supply limited by reason of scarcity of raw material. Producers say this is due to the scarcity of coke, which in turn is due to the inability of the coke ovens to obtain coal promptly as well as to a scarcity of railroad cars for transportation. Indications are that prices will strengthen, if they do not go much higher, and that the present demand will grow stronger. Sheets are about the only exception. They are reported to be just a trifle heavy at present. Prices for bar iron in carload lots are: 1.92c base, half extras f. o. b. Cincinnati; steel bars, 1.72c base, half extras f. o. b. Cincinnati. Both are retailed at 2.20c base, full extras, out of store. Beams are selling at 3c retail and angles and channels at 2.40c for base sizes. Black sheets are on a basis of 2.35c for No. 10 and $2.50 for No. 12, with $1 per hundred advance for galvanizing. We quote tank plates on a basis of 2.10c to 2.25c f. o. b. Cincinnati for ¼-inch and heavier. Wrought pipe and boiler tubes are quotable as follows for carload lots f. o. b. Cincinnati:

WROUGHT PIPE, BASING DISCOUNTS.

	Black Percent.	Galv. Percent.
⅛ to ½ in. inclusive	58.8 & 7½	46.8 & 7½
¼ to 12 in. inclusive	65.8 & 7½	53.8 & 7½

BOILER TUBES.

	Percent.
1 to 1½ in.	41.3 & 2½
1¾ to 2½ in.	38.8 & 2½
2¾ to 5 in.	48.8 & 2½
6 to 13 in.	38.8 & 2½

OLD MATERIAL.—The market is strong and higher and offerings are light. Everything available is readily taken at full prices. We quote:

Old No. 1 Wrought Railroad, net tons	$21 00 to 21 25
Cast Machine and Foundry, net tons	16 00 to 16 50
Old Iron Rails, gross tons	25 00 to 26 00
Old Steel Rails, gross tons	24 50 to 25 00
Old Short Lengths, gross tons	18 00 to 18 50
Old Iron Axles, net tons	27 00 to 28 00
Old Iron Car Wheels, gross tons	21 00 to 21 25
Stove Plate, net tons	11 75 to 12 00
Wrought Turnings, net tons	16 00
Cast Borings, gross tons	11 50

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, No 150 NASSAU ST., Sept 16.

PIG IRON.—During the past week the pig iron market was not marked by any development of fresh interest. So far as the situation in domestic iron for this year is concerned, there is the same scurrying that there has been for weeks past, but even with the good premiums the same command, the location of very little can be established. In consequence interest seems wholly centered in foreign irons, and although reports are circulated from time to time that these are not in as great request as several weeks ago, sales recently made and shipments coming in, do not bear them out. On all sides assurances are given that those who must have iron for this year have given up all hope of having their needs supplied from domestic sources, and are placing their reliance on foreign irons alone. While no noted advance in price has occurred in the latter, still prices show a stiffening tendency, and material is higher today by at least a shilling than a week ago. The better brands of Scotch irons are selling at from $22.50 to $23 per ton for New York delivery, while Middlesboro No. 3 is selling at $20.50 per ton, New York delivery, for small quantities, although for cargo lots better prices can be had. A fair quotation for large lots, New York delivery, is $19.25 to $19.50. One hears occasionally of German irons being purchased, but the tonnage is usually small. The market for irons for 1903 delivery may be said to be at a standstill, particularly so far as Southern interests are concerned. The latter are still out of the selling arena, and no definite information is obtainable as to when they will again enter it. Evidences are multiplying, however, that even if they were to open their books at once, they would have an extremely small tonnage to offer for sale so far as the first six months of the year are considered. One large interest doesn't hesitate about acknowledging that it has disposed of all it can produce for that period, and while others are not as candid, still in pretty reliable quarters it is said they are in about the same position. Advices from Birmingham report prices as well maintained, with spot iron selling as high as $25 at the furnace, and with Southern No. 2 foundry for delivery next year ruling strong at from $19 to $20 at the furnace, and with little offering. New York prices for this year's delivery, mostly nominal, are as follows: Northern: No. 1 X, $23.50 to $25; No. 2 X, $22.75 to $23.50; No. 2 plain, $22.25 to $22.50. Southern: No. 1 foundry, $22 to $23; No. 2 foundry, $21.75 to $22.50; No. 3 foundry, $21.25 to $22.75; No. 4 foundry, $20.75 to $21.25.

FINISHED IRON AND STEEL.—Business in the aggregate in structural material still continues to be of good proportions. Sales for next year's delivery are being made, and they form a respectable tonnage. Sheared steel plates are in especially good demand. One large mill effected a sale during the week of 1,000 tons of boiler plates for use in connection with the power house of the subway now in course of construction in this city. Delivery is promised by the first of next March at the earliest. In sheets there is no abatement of the weakness which has been observable for weeks past, and one of the largest jobbing houses in this city reports that the fall trade is not opening up as well as was expected. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.95c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 2.10c to 2.15c; flange, 2.25c to 2.30c; firebox, 2.30c to 3.50c; refined iron bars, 1.95c to 2c; soft steel bars, 1.95c to 2.10c. Sheets in carload lots, New York, No. 28, black, 3.18c to 3.25c; galvanized, 70, 10 and 5 off.

PHILADELPHIA.

Sept 16.

PIG IRON.—Importations of iron from England and Scotland are heavy and the first sale of German iron was made in this market a few days ago. The German iron, which is high in phosphorus, is sold at about $21 on dock, duty paid. Very little American iron is to be had and it is not an important factor at present. The foundrymen recognize that foreign iron must be depended upon until the anthracite coal strike is settled and there seems to be no prospect of an early termination of that struggle. Foundry coke for prompt delivery is very scarce and the furnace situation is no better than it has

been. The little American iron sold for this year commands from $23 to $23.50 for No. 2 X foundry. Scotch iron sells at from $22.50 to $23.50, duty paid, and Middlesboro at $20.50 to $21.

BILLETS.—Large quantities of foreign steel are being sold, the price being about $26.50, which is $5 lower than is asked for American steel.

FINISHED MATERIAL.—The demand for nearly all kinds of finished material is good. There is no change in prices, tank steel being 2.10c to 2.15c for small lots and 2c to 2.05c for carload lots. For structural material 2.25c to 2.50c is obtained for prompt delivery, but for delivery in 1903 1.72c, Philadelphia, is the price. For bars, prices are 1.92c to 1.97c for iron and 1.72c to 1.80c for steel. The demand for sheets is improving somewhat.

OLD MATERIAL.—The market is dull except for foundry scrap. We quote prices as follows: Old steel rails, $21.50 to $22; miscellaneous heavy steel scrap, $20.50 to $21; low phosphorus scrap, $27.50 to $28.25; old steel axles, $26.50 to $27.50; old iron axles, $29 to $30; old iron rails, $24 to $25; old car wheels, $20 to $21; choice scrap R. R. No. 1 wrought, $24.50 to $25.50; country scrap, $19.50 to $20.50; machinery cast, $19 to $20; No. 2 light scrap (forge), $17 to $18; No. 2 light scrap (ordinary), $15 to $16; wrought turnings, $16 to $17; wrought turnings, choice heavy, $18 to $18.50; cast borings, $10 to $10.25; stove plate, $13.75 to $14.25.

IMPORTANT PATENT DECISION ON BEAM MILL TABLES.

Judge Joseph Buffington, sitting in the United States Circuit Court at Pittsburg, Pa., handed down an important decision this week relating to the feeding devices for beam mills. John Brislin and Antonio Vinnac, both of Pittsburg, commenced suit against the Carnegie Steel Co., Ltd., in May, 1897, charging an infringement of first and second claims of the patent granted them on July 20, 1886, and several claims of a patent granted to Patrick Hanley and Francis M. Ritchey on November 16, 1886, and assigned to Brislin and Vinnac. The defense of the Carnegie Steel Co. was invalidity of the patent and non-infringement. The court sustained the claims of the plaintiffs and unless the decree is reversed by the higher courts nearly all of the mills in the country using the device will become entangled in suits growing out of this decision.

In opening his opinion Judge Buffington said the case is important, as it frees from, or subjects to, patent monopoly the mechanical rolling of steel beams used in modern building. He went into the question of rolling iron, describing the advance from manual to mechanical rolling that has made possible the manufactures of today. In view of the great advance, the court held that it would seem just that those who have, from an inventive standpoint, substantially brought about such advance should share proportionately in the gains thereof.

The key to the solution of the problem of continuous mechanical rolling—a pivoted table—was known to inventors but unused, the court said, for upwards of 40 years. A French patent was granted to Sauvage in 1857 for a three-high train of rolls with a lifting table before them. George Fritz, of Johnstown, Pa., took out a patent in 1872; Frederick J. Slade, of Trenton, N. J., one in 1879; Christopher Lewis, of Columbus, O., one in 1881, and Samuel T. Wellman, of Cleveland, O., one in 1883, in all of which the pivoted table figured to a greater or less degree. But so far as the patents show, the court found no further step in heavy mechanical rolling until the Brislin and Vinnac patent. The features of the patents of each were then described. Then the court says:

"In the Brislin-Vinnac device we find for the first time in heavy rolling—and if such a thing existed in lighter forms of rolling it has not been deemed sufficiently relevant to be called to our attention—the combination of a pivoted table, adapted to feed metal at both the upper and lower passes of more than one stand of such rolls. Throughout the mass of proofs in the record, the testimony of experts familiar with the practice of the art in this country and abroad, this one fact stands out in bold relief, unquestioned: no one prior to Brislin and Vinnac thought of, much less embodied in form, the coupling of a pivoted table and a movable carriage.

"Conceding that all the elements of Brislin and Vinnac were in themselves old, yet it must be conceded that they were the first to take the separate, individual elements of advance in the rolling art and so combine them as to accomplish continuous, complete, mechanical heavy rolling and make possible a new product, to wit, a machine rolled heavy beam. The separate steps of Fritz, of Slade, of Lewis, of Wellman, securing lateral, vertical movement and tilting movements, were each deemed worthy of patent protection and reward. Why then should not the step of Brislin and Vinnac, which carried this advance to the culmination in combining lateral and vertical in such a way that both movements could be used in each form of roll to which prior inventors had succeeded in applying but one of such movements, be deemed not only worthy of patent protection but of such favorable regard as the broad and important field it pertained to would warrant. A device which transfers from the field of human toil to mechanical work the handling of huge masses of iron heated to a point almost prohibitive to human handling is a beneficial factor that is not to be measured by the economies of a mere labor-saving machine."

The opinion states that the use of a pivoted table laterally movable is the potent factor and it is not questioned that these men were the first to point out the combination. The lateral movement enabled the table to serve a plurality of roll-stands, the vertical motion of the pivoted table enabled it to reach a roll-pass on a level other than that of the carriage. The power to move was in one factor, the power to reach in the other. The union of the two meant a flexible roller, which was a new mechanical factor with a new result—a machine-rolled product. The court will not accede to the view that this was only a mechanical assembling of existing devices. On the question of the manner of providing the power to operate the tables the court held that the method is not of importance.

The court sustained the charge that the first claim of the Brislin and Vinnac patent covers the vertical and lateral movement of the table. The second claim, which calls for a combination of carriages on each side of the rolls, and embodies devices for simultaneously inclining the roller frames of the two, was dismissed with the assertion that the Carnegie company has no such device. The Hanley and Ritchey patents were not sustained, being regarded as a mere engineering problem.

The American Shipbuilding Co. Tuesday closed a contract with the Eldorado Steamship Co., of Buffalo, for a steel freighter. The vessel will be 374 feet over all, 354 feet keel, 48 feet beam and 28 feet deep. She will have triple expansion engines, cylinders 20, 33½ and 55 inches, with 40-inch stroke. Steam will be furnished by two Scotch boilers 14 feet in diameter and 12 feet long, to be allowed 170 pounds working pressure. The boat, which will built at South Chicago, will cost $250,000, and according to the contract she will be ready for July 1, 1903.

Among orders taken by the Allis-Chalmers Co. in August are the following: Carnegie Steel Co., Pittsburg, repairs for 42-inch and 60-inch by 60-inch blowing engine; Pawling & Harnischfeger, Milwaukee, one 18-inch by 36-inch 1890 frame Reynolds Corliss engine; Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., three vertical standard long crosshead 44-inch and 84-inch by 60-inch blowing engines; Iroquois Iron Co., Chicago, one 42-inch and 87-inch by 60-inch vertical long crosshead blowing engine; Detroit Copper & Brass Rolling Mills, Detroit, Mich., one 26-inch by 48-inch 1890 Reynolds Corliss engine.

Promoters of the long discussed sewing machine consolidation have held a meeting in New York recently, according to daily newspaper reports, but the presidents of the White Sewing Machine Co. and the Standard Sewing Machine Co., both of Cleveland, say they will not enter the proposed company.

The London Fence Machine Co., London, Ont., is about to establish a plant at Cleveland, O. A site has been leased and the company intends to commence building operations early in October. It is expected that a part of the factory will be ready to commence work by the first of the year.

The Passaic Rolling Mill Co., Paterson, N. J., has not yet been sold to the Passaic Steel Co., which was recently incorporated, but negotiations for the transfer of the property are in progress.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE IRON & STEEL PRESS CO.,

ROSE BUILDING, CLEVELAND, OHIO.

G. H. GARDNER, President and Treasurer.
JOHN A. PENTON, Vice-President.
A. I. FINDLEY, Secretary.

A. I. FINDLEY, - - - - - - - - - - - EDITOR.
ROBERT I. CLEGG, - - EDITOR MACHINERY DEPARTMENT.
GEORGE SMART, - - - - - - - ASSOCIATE EDITOR.

CHICAGO : 519 Monadnock Block, GEO. H. GRIFFITHS, Manager.
PITTSBURG : 429 Park Building, A. O. BACKERT, Manager.
NEW YORK : 150 Nassau St., D. C. WARREN, Manager.
THE CENTRAL WEST : R. A. EVANS, Manager.

Subscription, $3.00 per annum. To Foreign Countries, $4.00.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

SEPTEMBER 18, 1902

THE FOUNDRY'S SHARE IN THE ADVANCE.

Jobbing founders have always had difficulty, in times of advancing prices for iron, in getting proportionate advances for their castings. While occasionally there have been organized efforts to maintain prices on steel castings and on the product of malleable works, and while the stove manufacturers have done some effective work in staying the demoralization coming from excessive competition, the jobbing foundry operates in one of the most untrammeled of markets. In this respect the general founder is on a footing with the furnace company from which he buys his iron, the foundry iron market being completely dominated by the law of supply and demand. Yet there are some differences which make it less easy than it appears for the consumer of foundry pig iron to follow the iron market, advancing his prices as iron advances. In 1899, under large precautionary buying that gave many foundrymen more than an 18 months' supply of iron on contracts running but 12 months, the pig iron market advanced unnaturally, and as high as $24 at Northern furnace was paid for No. 2 for prompt delivery. The foundryman paid far less for his contract iron, much of which was bought in the early part of the year and late in 1898, the average of the year's shipments being probably between $14 and $15.

With a good margin of safety on their raw material, foundries were not disposed to exact a corresponding dollar for every dollar of pig iron advance, as new work came to them from time to time. The foundryman was not used to such bulges in his own business, and indeed competition was ever present and he was bound to keep his shop full. Thus, while pig iron went to $24, castings at the top prices reached did not pass a $20 basis for pig iron, and this, as with pig iron, on a comparatively small tonnage.

But the buyer of castings had been watching the pig iron market, and when the slump came insisted that as pig iron had fallen from $24 to $16, there should be a 33 1-3 percent reduction in his castings. Learning wisdom from experience, the foundries are now more urgent to have the price of castings, apart from yearly and half-yearly contracts, follow the pig iron market. They find additional reason for this in the fact that in many cases they have been unable to secure iron they have bought and must enter the market and pay top prices for prompt shipments of English, Scotch and Canadian irons to avoid the alternative of a shut down. Moreover, the buyer of castings is now so insistent for deliveries that the founder is learning to stand a little more erect when he names his price than has been his wont. He has been helped to this by the steady advance in his labor account, which with the higher basis for all his raw materials makes his cost the highest in years.

A "CRITICAL SITUATION" FOR TIN PLATE LABOR.

The *Amalgamated Journal*, evidently with no thought but for the welfare of the tin plate workers, has an editorial on "The Critical Situation" in the tin plate trade. It says that the sluggish condition in the tin plate and sheet trades is such as these industries have not seen before; that warehouses and mills are overstocked with finished material, in spite of the fact that many mills have been idle for months while others have only been in partial operation. "This condition of affairs," it adds, "at this time of the year, when the stock made last year should have all been shipped, and the warehouses emptied to make room for the stocks that should be made during the coming winter months, is something unusual, and bespeaks extraordinarily hard times for the workmen in the mills controlling these trades." These conditions are attributed to the large increase in tin plate and sheet mills in the past few years, putting the producing capacity far beyond the consuming power of the domestic trade, and the inability of American producers in these lines to compete with foreign manufacturers in world markets. The situation is made a text for a further reference to the vote recently taken by the tin plate workers on the proposal to reduce 25 percent the wages of labor entering into export tin plates, and the *Journal*, as the organ of the Amalgamated Association's officers, argues that in their recommendation on that subject the leaders were prompted solely by consideration of the welfare of the men. It is intimated that events may make it advisable to call a special convention or a conference of representatives of the lodges to consider the matter, but that this would only be done at the request of the tin workers themselves.

Of course the addition of new tin plate plants has not diminished the opportunities for employment of tin plate workers in the United States. The stimulus given the industry has doubtless drawn new workers into it in the past year, including many from abroad, so that there is far less steady employment than was formerly the case. This is the condition the Amalgamated Association has to face, and with it a diminished consumption for canning, due to the scarcity and high prices of fruits and vegetables. That the competition will be greater before it is less appears from the list of new tin plate mills published in these columns on July 31, showing that 59 hot mills are being built by independent interests, and that their capacity will be

120,000 tons a year—an increase of more than 25 percent in the capacity of the tin plate industry.

This condition points to sharper competition in the coming year, and the same statement applies in perhaps less degree to the sheet industry.

GERMAN COMPETITION IN IRON AND STEEL.

The meeting of the Iron and Steel Institute at Düsseldorf in the first week of September is made the occasion for extended articles in the English iron trade and engineering journals on the rapid development of iron and steel manufacture in Germany. Current market comment in our English contemporaries illustrates the timeliness of such articles. The London *Iron and Coal Trades Review* says, for example, in its Middlesbrough report:

It is important to notice how much the Cleveland ironmasters have benefited by the upspringing of the demand from America for pig iron; there would have been a poor showing in August if it had not been for the 24,875 tons sent across the Atlantic. During the three years prior to February last the total quantity sent from this district to America was only 3,500 tons, and that was despatched in May, 1901. The reduction in German custom is fairly well made up for by the increased business with the United States. Germany, which has had as much as 75,000 tons of pig iron in a month from Cleveland, and in August, two years ago, had 53,394 tons, in the same month last year took only 17,488 tons, and this year but 7,252 tons. The United States is by far our best foreign customer, taking the place which Germany held for years.

In its Glasgow report on the steel rail market, the same paper says that "at the moment German rail makers are underbidding us in the States by 7s per ton, and as there are orders pending for South Africa and 18,000 tons for Victoria such a difference must be a source of concern to local makers."

Editorially our contemporary says that its articles tracing the growth of the German iron industry "show in the clearest and fullest manner how far the Germans are getting abreast of us in the solution of metallurgical problems, and suggest once more the necessity of our 'waking up,' if we are not to yield a large part of our supremacy to a nation whose natural resources are in many respects inferior to our own." American steel manufacturers appreciate that their competitor in neutral markets is to be Germany and not Great Britain, and that in Great Britain they will have just as sharp competition from Germany as from British manufacturers themselves. Incidentally the above extracts furnish food for thought to those at home who have been clamoring for the removal of iron and steel duties. The German iron and steel trades, be it known, are largely controlled by syndicates, operating for the most part under cover of tariffs which some of them desire to have increased as a defense against the "American peril."

LABOR SAVING MACHINERY AND THE WORKER.

The effect on industrial conditions of so called labor saving machines, whose invention is often deplored by workingmen, is illustrated in the case of typewriters. A pamphlet which has just been issued by the United States census bureau on the typewriter industry says:

"Not only has the steadily increasing demand opened a new field for skilled labor in the manufacture, but the effort to secure the best possible results from the use of the machine has created a new profession. Not long after the machine was introduced the need of skilled operators became apparent, and the result of this has been the giving of employment to thousands of persons."

While some political economists may claim that the typewriter dispenses with the labor of many who otherwise would devote time to the work of writing by hand, the fact is that a very large amount of work done now by typewriters would not be done at all if the machine had not been invented. The story of the new machine is about the same in every case, although sometimes it is not as easy as with the typewriter to show that an invention creates a demand for labor. For example, the laborer who is thrown out of employment by modern ore unloading machinery will find it difficult to see that a demand for labor is created, and in this and other cases the readjustment may be severe, because it throws unskilled laborers out of work, but ultimately the machine creates a new field of labor. The ore unloading machine, by reducing the cost of material, is certain to stimulate the construction of buildings in which iron and steel are used. The tendency is to increase demand for skilled men, but for even the common laborer the chance for employment is increased as the cost of material is reduced.

The iron industry affords striking illustrations of the displacement of hand labor by machinery, but at the same time a marked increase in the number of men given employment by it. The census statistics for 1900 show that as against 77,555 wage earners in the blast furnaces, steel works and rolling mills of the United States in 1870 there were in 1900, 222,607 or three times as many. In the interval the average price of products—pig iron, steel and all forms of finished material—was lowered from $63.49 a ton to $27.25 a ton, or 57 percent. Significant proof of the potency of lowered prices in stimulating consumption is the leap from 3,263,585 tons of all forms of iron and steel products in 1870 to 29,507,860 tons, or more than nine times as much, in 1900.

The bi-monthly adjustment of the bar iron scale was made at Youngstown, Tuesday, and resulted in no change in the present rate of wages. The rate is $6 per ton for puddling and 70 cents for heating and rolling.

Contracts for the improvements contemplated by the Otis Elevator Co., Chicago, have been let to a Cleveland construction firm. The first to be erected is a foundry, which will cost $75,000, and a big warehouse and a machine shop are soon to follow. The company will expend in all about $250,000 in the enlargement of its plant.

The Breckenridge Foundry, Meriden, Conn., which had been closed for over ten years, has been leased by the M. B. Schenck Co. and reopened. The plant has been equipped with new machinery.

The Grand Rapids Edge Tool Works, Grand Rapids, Mich., will shortly begin the erection of a new building 60x100 feet and will occupy it in place of the structure in which the business has been conducted for twenty-five years.

Frederick W. H. Rogers, who for many years was engaged in the wholesale machinery business in Chicago, died Sept. 13, in that city, aged 89 years. He was born in Connecticut and went to Chicago fifty years ago.

The machinists of the Chicago, Milwaukee & St. Paul railway have been granted the increase to 32 cents an hour for which they asked some weeks ago.

SUGGESTED AT THE SHOP.

BY F. O. REMAN.

A 24-story building is something of a structure, but the means to bring it into being are even more interesting to me than the thing itself. I recently saw one which had progressed about half its way upward and noted the now familiar plan of laying brick at different stages of the building simultaneously. The appearance of the various tiers where the brick facing was being placed in position is well known to any one who has the city opportunity of seeing the gradual growth of a skyscraper. There are other things. The steel frame not only gives a powerful permanency to the building when completed but aids lustily in its own construction. The cranes, interior and exterior, jib and elevator types, go up with the girders as the latter get into place and the framework has all the properties of a machine. In fact it is a machine which absorbs girders, columns, ties, struts and rivets in the production of a business sheltering and handling device.

* * * * *

The elevator equipment of one of these lofty latter-day products is a thought-provoking subject. The carrying of passengers at all speeds up to—and perhaps beyond—400 feet per minute, with frequent stops for hasty humanity of both sexes and all ages, the few accidents with the hosts of people hoisted, is a modern monder. Then there are miles of wiring for light and sound transmission, the heating and power plant with more miles of pipe and a multitude of valves and fittings. Everything of a kind and type entirely different from the old-time office building—everything with just one exception.

* * * * *

It is not many years ago that machine tool and engine designers were slavish followers of architectural precedent. A machine had all the appearance of having been designed absolutely apart from and independent of the means of support. No self-respecting machine or anything else would stand for such treatment for a minute, were it a matter where choice could be made. The architectural influence was paramount. Decorated panels, Gothic, Ionic and unclassified (frequently the latter), supporting columns; ornamental entablatures, cornices, friezes, and the like predominated wherever they could be introduced. Some one noticed that square corners were awkward and, in hope of a reform therein, sought out other reasons for their improvement out of the shop. The round corner was stronger and the smooth surface non-attractive to dirt and therefore capable of setting a good example and maintaining a high standard of efficient cleanliness. The compounded and confounded ogee of the architect and the carpenter gave way to the straight line and simple curve of the machinist and patternmaker. The frame with limbs and levers following the lines of resistance shook loose from the trammels of other trades and stood squarely on its feet. No one thought of hiding the bare lines and surfaces of the new product by any architectural disguise. The thing stood upon native merit or fell out of the line. The architectural and the mechanical wouldn't mix.

* * * * *

Now our architectural friends are up against a like proposition. A tall building with steel frame, power equipment, hoisting apparatus and all the rest of the things mechanical is today more than ever a machine shop product. The engineer rather than the architect is it. The architect does not take kindly to the change. His professional feelings are too sensitive for the calm contemplation of a beautiful building turned remorselessly into a mere machine. The machine part must be hidden at any cost. The frame is therefore disguised to suit his wishes. A coating of terra cotta or any other tile or brick, stone or markle, shields the steel from view and to all appearances the building is something entirely different from what it actually is. This is really within a measurable distance a tall type of an architectural lie. But everybody is on to it.

* * * * *

We got over the building of imitation stone bridges when the era of steel construction started at a rapid rate and a skyscraper is only one-half of a cantilever bridge anyway. Of course a bridge does not have to be enclosed like a building; or perhaps it may be safer to say that there are few exceptions to this rule. But why not have the building with a covering of concrete? Enough to soften down the asperities of the naked design and protect the surface of the metal from the action of the weather. The rounding of outer corners and the making of fillets with the protection of paint are all in the direction of everyday machine shop system; and while I am not yet out of a job I am looking to the engineering increase elsewhere. Business is very good, thank you; but here in the present path that the architect is traveling there seems to be an opportunity that I expect will soon be seized.

* * * * *

The change is under way now. Lots of the interior work is being done in this very manner, or so at least it appears to a mechanical pair of eyes. It is only natural that the scheme will work outside and give rise to a severely plain type of structure whose strong straight lines will be none the less pleasing to the eye because they suggest the elastic strength of steel rather than the solidity of stone. The imitation is always, and at least seven degrees, inferior to the real thing, anyhow.

Report of the Sloss-Sheffield Steel & Iron Co.

The report of the Sloss-Sheffield Steel & Iron Co. for the quarter ended August 31 shows a net profit from operation of $347,168. After deductions for depreciations, charges to extraordinary repairs, sinking fund and interest on bonds, etc., there remains a surplus of $251,969. The quarterly dividend on the preferred, amounting to $114,000, brings the surplus down to $137,969, which is applicable to dividends on the $7,500,000 outstanding common stock. This is less than 2 percent on the common. The surplus of the company on Nov. 30, 1900, was $546,099; Nov. 30, 1901, $539,750, and Sept. 1, 1902, $848,634. The report for the quarter follows:

Net profit from operation		$347,168
Deductions for depreciations and charges to extraordinary repair and renewal fund		35,199
Total profits		$311,969
Deduct 3 months' accrued int. bonds	$54,500	
Deduct 3 months' proportion of taxes	7,500	60,000
Net surplus		$251,969
Actual surplus carried over May 31, 1902		710,665
Total surplus		$962,634
Quarterly dividend on preferred stock		114,000
Total surplus to Sept. 1, 1902		$848,634

The report says that the mines of the company during the quarter were closed for a period of fourteen days awaiting the adjustment of the miners' wage scale. The statement is also made that the deliveries of pig iron during the quarter were made on the basis of $12 a ton for No. 2 foundry (Birmingham), whereas the output for the first six months of next year has been sold on a basis of $17 a ton. The regular quarterly dividend of 1¾ percent on the preferred stock was declared.

Chas. T. Schoen has erected at the Bethlehem Steel Works one unit of his new press and rolls for making solid steel car wheels. His further investment in this matter will be dependent upon the results of the trials of this unit. Mr. Schoen's purpose is to establish a big plant near Pittsburg, if the process is successful. He is confident that he can make a solid steel wheel in competition with the chilled cast iron wheel. While the first cost will be greater, it is argued that the better wear and the greater immunity from breakage will make the steel wheel cheaper in the end. The wheel will be rolled from cast steel blanks which have had a preliminary shaping in a press.

The firm of Esterly & Clancy, iron and steel brokers, 409 Superior Building, Cleveland, has been formed to sell tin plate and sheets, metals and steel roofing. The members of the firm are Charles L. Esterly and Edward J. Clancy and both have had experience in the tin plate, sheet and metal jobbing trades.

SPECIFICATIONS FOR FOUNDRY SUPPLIES.

Probably no more valuable contributions to the practical side of foundry chemistry have been made in this country than those of W. G. Scott, the well known chemist of the J. I. Case Threshing Machine Co., of Racine, Wis. In a paper at the meeting of the American Association for Testing Materials at Atlantic City, in June, Mr. Scott presented a paper which exhaustively discussed the effects upon cast iron of varying ratios of the metalloids. In another line, that of standard specifications for pig iron and other foundry materials, Mr. Scott has rendered signal service to the foundry world. His pig iron specifications have been published heretofore in these columns, but not in the revised form. The call for these, as well as for Mr. Scott's specifications for coke, sand and other supplies, makes it advisable to publish the full set of specifications on which materials are bought for the Case foundries. The first three specifications—those for foundry pig iron, for coke and for scrap, are embodied in the contracts for these materials. In the case of molding sand and foundry castings the specifications are for a guide and reference, indicating the standard which it is desired to reach:

No. 296—Foundry Pig Iron.

(Revised July 14, 1900.)

Under these specifications we desire a good, clean iron, as free as possible from dross, kish, oxide, sand, etc.

The percentage of "sows" must not vary to any great extent from the usual amount found in a strictly graded iron, according to the old fracture method.

All grades of pig iron will be bought strictly by analysis, and must conform to the following specified percentages:

FOUNDRY No. 1.

Silicon, must not be less than	2.50%
Sulphur, must not exceed	.03%
Phosphorus, should not exceed	.60%
Manganese, should not exceed	.50%
Total carbon, not specified.	

The carbons will usually be between 3.00 and 4.50 percent in this grade.

Any car of No. 1 foundry pig which shows on analysis less than 2.40 percent of silicon or more than 0.035 percent of sulphur will be rejected. (See note.)

FOUNDRY No. 2.

Silicon, must not be less than	1.95%
Sulphur, must not exceed	.04%
Phosphorus, should not exceed	.70%
Manganese, should not exceed	.70%
Total carbon, not specified.	

The carbons in No. 2 will generally range from 2.90 to 4.20 percent.

Any car of No. 2 foundry pig which shows on analysis less than 1.85 percent of silicon or more than 0.045 percent of sulphur will be rejected. (See note.)

FOUNDRY No. 3.

Silicon, must not be less than	1.35%
Sulphur, must not exceed	.05%
Phosphorus, should not exceed	.80%
Manganese, should not exceed	.90%
Total carbon, not specified.	

The carbons in this grade will usually be between 2.50 and 4.00 percent.

Any car of No. 3 foundry which shows on analysis less than 1.25 percent of silicon or more than 0.055 percent of sulphur will be rejected.

NOTE.—It is distinctly understood that all grades of pig iron will be bought according to analysis and not by fracture.

As we mix by analysis in the foundry, it necessarily follows that the pig iron should be according to specifications. Furthermore, if we accept an iron as No. 2 which fails to fill the No. 1 conditions, we might eventually be overstocked with No. 2, and be unable to get the results aimed at in the cupola mixture; consequently an iron sold as No. 1 or any other specified grade, will be rejected if not strictly within the specifications for said grade.

When a car of pig iron is received it will immediately be sampled by an experienced man (professional sampler) who will select a certain number of pigs from different parts of the car, which according to his judgment shall represent the *average* quality of the iron. These pigs will be broken and drillings taken from the face of the fracture will be sent to the laboratory for a chemical analysis. The analysis will decide the acceptance or rejectment of the iron. Rejected cars will be held subject to the shipper's order.

In case of dispute, the furnace or the seller shall have the right to resample the iron in conjunction with the buyer, each to select five pigs. Drillings from the ten pigs, after being well mixed, will be divided into three different samples, one lot to be analyzed by the furnace, one by our laboratory, and one by a disinterested chemist, agreed upon by the parties in dispute. The two analyses nearest alike will be accepted as the proper chemical composition of the iron.

In all chemical work relating to pig or cast iron, it is understood that the standardized drillings furnished by the American Foundrymen's Association are to be used as "standards." The following chemical methods are used in our laboratory, viz.:

Silicon—Drown's method.

Sulphur—Evolution and titration with iodine (volumetric), as a rapid method, and the oxidation method (gravimetric) in all cases of dispute.

Phosphorus—"Emmerton's Method" for rapid work, and the "Molydbate Magnesia" method for very accurate determinations.

Manganese—Deshay's or the colormetric method for rapid work, and the "Acetate Process" for extremely accurate work.

Carbons—Carbons are worked by the colormetric and combustion methods.

In case of dispute, check analyses are made by gravimetric methods.

No. 270—Silver Gray (S. G.) or Silicon Pig.

Under this specification we expect a pig iron medium high in silicon and not too low in graphitic carbon. This iron is to be used as a softener.

Silicon, must not be less than	3.00%
And should not be more than	5.50%
Sulphur, must not exceed	.04%
Phosphorus, should not exceed	.90%
Manganese, should not be less than	.30%
Total carbon, should not be less than	2.50%

Any car of S. G. iron, showing on analysis less than 3.00 percent of silicon, or more than 0.055 percent of sulphur will be rejected.

No. 271—Ferro-Silicon Pig Iron.

Under this specification we prefer a pig iron with about 8.00 percent silicon. The general range for silicon in this grade is from 6.00 to 12.00 percent.

Silicon, must not be less than	7.00%
Or more than	12.50%
Sulphur, must not exceed	.04%
Manganese, not specified.	
Total carbon, not specified.	

As a rule the graphitic carbon will be low, varying from 3.00 to 0.50 percent. Manganese may occasionally vary from 0.20 to 3.00 percent, or more.

Cars will be rejected which show less than 6.00 percent of silicon, or more than 0.045 percent of sulphur.

No. 272—Manganese Pig (Manganiferous Iron).

In this specification we desire an iron of from 1.00 to 2.50 percent manganese. The ordinary No. 1 pig iron, running about 1.50 percent in manganese, will fill all the conditions required.

Silicon, should not be less than	2.50%
Sulphur, must not exceed	.04%
Phosphorus, should not exceed	.70%
Manganese, must not be less than	.90%
Carbon, not specified.	

As a rule, the higher the manganese, the greater the proportion of combined carbon. Combined carbon may range from 0.30 to 3.00 percent, while the graphitic carbon may vary from 0.40 to 3.50 percent.

NOTE.—A few remarks on manganiferous iron may help to define the dividing line between the ordinary foundry pig and the regular manganese iron.

Manganese Pig is an ordinary iron made from ore containing somewhat more manganese than the regular foundry irons; it will run from 0.80 to 3.50 percent in manganese. It is added to foundry pig, in cupola practice, to raise the combined carbon, thereby increasing the strength. In a measure it neutralizes the effect of sulphur, removes excess of gas and prevents blowholes. It must, however, be used with caution, as a low silicon and carbon, with high manganese, gives hard iron and alters the shrinkage.

[Continued on page 48a.]

CINCINNATI MACHINERY TRADE.

Sept. 16.

The machinery trade reports no abatement of activity; in fact some manufacturers say that for this fall they anticipate the largest business they have ever had. Several new buildings are in course of construction for the accommodation of manufacturers who have outgrown their old quarters. Everything surrounding the trade points to a continuance of great activity. The great bulk of the business is still with the domestic trade, the foreign demand showing no particular change. Orders for castings are keeping the foundries busy up to capacity and many orders have been placed outside of the city owing to lack of facilities here. These orders have gone largely to manufacturers of agricultural implements who take them during the summer months to keep their foundries employed.

The settlement of the machinists' strike on the Pacific Coast has revived business there and new shops are springing up all along the line from Seattle to Los Angeles. Cincinnati is getting a share of these orders, at least enough of them to comment on as a feature in the trade. Trade with the South is also reported noticeably better.

There are numerous specifications being submitted for heavy orders for railroad and government shops.

The Cincinnati Planer Co. is now filling a large order for several car loads of planers for the American Locomotive Works at Schnectady, N. Y. The first car went forward on the 10th.

John Steptoe & Co. expect to occupy their new building on Colerain Ave. and Hopple St. about Oct. 15. The main building is 140x65 feet, two stories, with two wings, 50x100 feet, of one story.

M. L. Andrews & Co., manufacturers of single spindle and multiple wood boring machines, are busy in their line. Among the latest improved tools which they have brought out is a large vertical boring machine for the Moline Wagon Works of Moline, Ill. This machine will bore forty-one holes in the same time formerly taken to bore one hole on a single spindle machine. They are now figuring on a 51-spindle machine for the D. M. Osborne Mfg. Co., of Auburn, N. Y.

Several new foundries are in prospect and while nothing definite can be stated at present, it is understood that some of the projects are well along.

The S. Obermayer Co. are erecting a new three-story addition to their plant, 60x90 feet. They are now running night and day.

Labor is reported scarce and high. This is a feature both in the foundry and machine industries.

Foundrymen, so far as inquired of, report no serious inconvenience at this time in getting iron. Deliveries seem in the main to be satisfactory.

Francis B. Loomis, the United States Minister to Portugal, who is now in London on his way to New York, according to a cable dispatch, says: "There is an excellent field in Portugal now for the introduction of American machinery, carpenters' and mechanics' tools, agricultural implements, etc. The Portugese are increasing the area of their grain production, with the object of raising all their own grain, and whenever they have a good season they can easily do it. American machinery could be introduced, with Lisbon and Oporto as the distributing points. The work must be done carefully and systematically, however, by men accustomed to deal with Latin peoples."

As a result of the conference between National President McMahon of the Blast Furnace Workers' Association, Manager Peters of the Lawrence furnace, Ironton, O., and a committee of the workmen, the settlement of the wage controversy has been left to an arbitration committee. Pending a settlement, the men will continue at work at present wages.

Officials of the United States Shipbuilding Co. have prepared a statement showing the estimated combined net earnings of that company and the Bethlehem Steel Co. to be $3,883,730 per year. The fixed charges of the company are as follows: Interest at 5 per cent on $16,000,000; sinking fund requirement, $200,000; interest on $10,000,000 collateral bonds, $500,000; sinking fund requirement, $200,000; total, $1,200,000. Dividends on the 6 percent preferred stock will amount to $1,200,000, leaving $983,730 for betterments and interest on the common stock.

American Locomotive Co.'s First Year.

The first annual report of the American Locomotive Co. has just been issued by President S. R. Callaway. This company has $50,000,000 of capital outstanding and no funded debt. The gross earnings for the twelve and one-half months to June 30, were $26,239,394; the operating expenses, $23,291,217; the net earnings, $3,107,177; fixed charges, $105,805; profit available for dividend, $3,001,312; dividend on preferred stock (7 percent), $1,750,000; surplus, $1,251,312. The common stock is entitled to receive dividends after the 7 percent has been paid on the preferred. President Callaway says the outlook for the current fiscal year is very satisfactory. Contracts for new locomotives in large numbers have been booked for delivery as late as the autumn of 1903. The avowed aim of the directors is to increase the company's profit through the lowering of manufacturing and administrative cost rather than by increasing the selling price of the locomotives. In the last year the company has expended $1,629,228 for additional land, new buildings and machinery.

A New Alliance, O., Industry.

The Standard Bolt & Mfg. Co. of Alliance, O., has its new plant about completed, and is ready to take orders and push business in its special lines, which consist of the manufacture of machine bolts of all standard sizes from ⅜-inch to 2½-inch, as well as track bolts, nuts and boiler and structural rivets. They have already in stock a good lot of best quality of Bessemer and open hearth round bars of the various sizes for bolts and rivets.

This plant is new throughout. The main building is 208x70 feet, boiler house, detached, 34 feet square, also building for gas plant, all of brick, stone and glass with slate roofs. Equipped with the very best modern machinery. Bolt, nut and rivet machines were furnished by the Acme Machinery Co. of Cleveland; engine and boiler by Brownell & Co., Dayton, O.; planers, lathe and drills for the machine shop were purchased through the Cleveland agency of Manning, Maxwell & Moore; other machinery, of Cleveland Punch & Shear Co., the Ajax Co., Cleveland; Borden Co., Warren, O.; Chas. E. Wright Co., New Orange, N. J. For fuel for bolt and rivet furnaces, the company has had installed a complete gas plant by the Acme Gas Co., Chicago, Ill.

American Tin Plate Mills for Italy.

The Gruson Iron Works, of Eddystone, Pa., through their representatives, F. R. Phillips & Sons Co., of Philadelphia, have been awarded a contract for a tin plate plant to be erected in Italy. It consists of three hot and four cold mills and all other equipment belonging to a modern American mill. F. R. Phillips & Sons Co. also have the contract for the tin machinery in connection with the above. This is the first American contract for tin mills to go abroad.

The board of directors of the Baltimore & Ohio R. R. has authorized the issue of $42,500,000 additional common stock. The purpose of the issue is to pay for equipment acquired and to be acquired, $20,000,000; for construction and equipment, $12,500,000, of which $4,000,000 is to double track the line from Newcastle to Akron, $2,500,000 for yards at Keyser, Fairmount, Holloway, Newcastle and Connellsville, and $6,000,000 for other construction of various kinds; $10,000,000 to pay for stocks, bonds, etc., acquired and to be acquired under the P., L. E. & W. Va. plan and placed under that mortgage.

The Wilks Pattern & Woodworking Co., Toledo, a new concern, is becoming a factor in the industrial life of that city. The officers are: Chas. T. Wilks, president; C. H. Cummins, vice president; Thos. Davies, secretary and treasurer; Wm. D. Feverman, manager.

Steel Foundry of the Pennsylvania Steel Co., Steelton, Pa.

The Pennsylvania Steel Works rank among the oldest steel industries in Eastern Pennsylvania, Bessemer steel having been made there as early as June, 1867. The Steelton Works are located on Susquehanna River, about 3½ miles from Harrisburg, Pa. Excellent railroad facilities are provided by both the Pennsylvania Railroad and the Philadelphia & Reading Railway.

The Pennsylvania Steel Co. operates three foundries, a gray iron foundry for turning out such castings as are required in the company's works, there is also a foundry attached to its frog, switch and signal department and a new steel foundry has recently been completed, and it is to this latter that this article will be devoted. The Pennsylvania Steel Co. has for a long time manufactured steel castings, both for its own use and for outside consumption, and the demand from the latter source has increased to such an extent that the company has recently found it necessary to build a complete new steel foundry in order to take care of this trade. With this completed, the Pennsylvania Steel Co. will be more of a factor in the steel casting trade than heretofore.

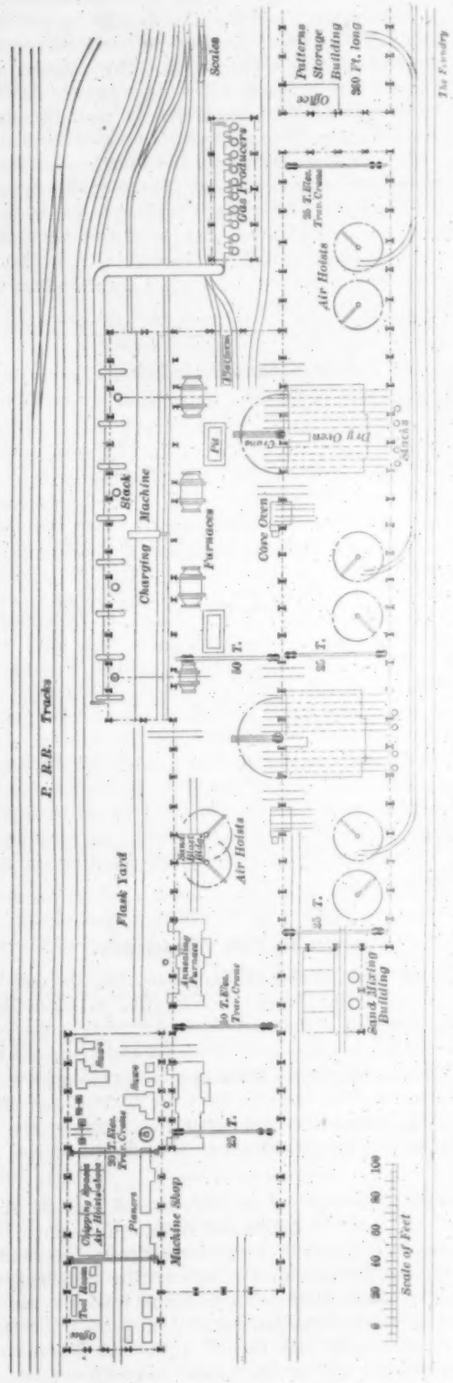


FIG. 1.—PLAN OF THE PENNSYLVANIA STEEL CO.'S STEEL FOUNDRY, STEELTON, PA.

When completed the new foundry will have a length of 756 feet and a width of 134 feet, together with a lean-to 40 feet wide in the rear of the furnaces. The building is of steel construction throughout, the walls and roof being formed of corrugated iron. In laying out the plant special attention was paid to obtaining as much natural light as possible, and in addition the interior of the roof has been painted white, which tends to increase the amount of light throughout the building. A system of arc lights is provided to thoroughly illuminate the plant when artificial light becomes necessary.

The plant is divided into two bays, each 67 feet wide. In the one where the molding floors proper are located there are three 20-ton traveling cranes, all provided with a 10-ton auxiliary hoist and having a clear lift of 25 feet. In the bay next to the furnaces, which is given over to the assembling of the molds after being dried, and to the molding of specially designed shapes, the annealing furnace, the sand blast apparatus, cold saw cutting off machines, etc., there are two traveling cranes of 50 tons capacity, each provided with 25-ton auxiliary hoists, and one crane of 25 tons capacity with a 15-ton auxiliary hoist. All of the cranes in this department have a clear lift of 40 feet.

An inclined, narrow-gauge track provides a means for reaching the charging floor of the furnaces. Arrangements have also been made for the casting of ingots, in case these should become desirable. Ample core oven space has been provided and this will be doubled when the shop is finally completed. At the present time, one 10-ton and one 20-ton open-hearth furnace are completed and two more 20-ton furnaces are contemplated. These are of the Campbell tilting type, designed by H. H. Campbell, general manager of the works. The electric power to operate furnaces, cranes and other shop equipment is obtained from the company's central power plant. From three to four heats can be obtained from each furnace daily, and it is calculated that when completed their plant will have a capacity of 250 tons per day. A gas producer plant with sufficient capacity to take care of this part of the works has been provided.

The plan of the works shown herewith gives a fair idea of the general arrangement of this foundry. It will be noticed that everything moves continuously toward the shipping department without any retracing. From the molding floor the molds pass through the core ovens and from there to the assembling rooms where they are cast and the flasks and sand returned to the molding floor while the casting proceeds to the cleaning department. Casting pits are provided for handling special ingot castings of as great a length as 27 feet. A fully equipped pattern shop together with fire proof storage vaults are located conveniently to the foundry. The machine shop, which will be 200 feet long by 60 feet wide is nearly completed, and will contain a complete outfit of up-to-date machinery for handling steel castings.—[The Foundry.

Tenders are being invited for the supply and delivery, free on rail Pietermaritzburg, Natal, South Africa, of 8 miles of rails, 938 pairs of fish plates (complete with bolts and nuts), 938 sole plates (complete with bolts, nuts and clamps), and 2,345 copper bands. Specifications may be obtained from the office of the borough engineer, Pietermaritsburg, and from the corporation's London agents, Ford Bros., 71 Southampton St., Pitzroy Square, W. Bids are also asked for six miles of rails, 704 pairs of fish plates (complete with bolts and nuts), 21,120 dog spikes, 1,408 crab bolts, nuts and clips and 1,760 copper bands.

James W. Copeland, 934 Equitable Bldg., Denver, Col., has been appointed sole agent for the State of Colorado, for the Scaife and We-Fu-Go water softening and purifying systems, manufactured by Wm. B. Scaife & Sons Co., Pittsburg. Mr. Copeland was formerly located at St. Paul, where for a number of years he was a manufacturers' agent, and recently opened an office in Denver. He has given the subject of water purification considerable attention.

THE CUBAN STEEL ORE CO.

At the meeting of the stockholders of the Cuban Steel Ore Co., held in Philadelphia Sept. 10, a resolution was passed asking the Girard Trust Co., of New Jersey, trustee under the mortgage, to take hold of the affairs of the company and wind them up for the benefit of all concerned. The promise of a large ore deposit, given by the earlier work on the properties, which are located 35 to 45 miles west of Santiago de Cuba, was not realized, and the company retires from the field with a heavy loss. Pennsylvania Steel Co. interests were important holders of the stock. The following report from the board of directors to the stockholders was read at the meeting in Philadelphia by the acting president, Geo. S. Graham:

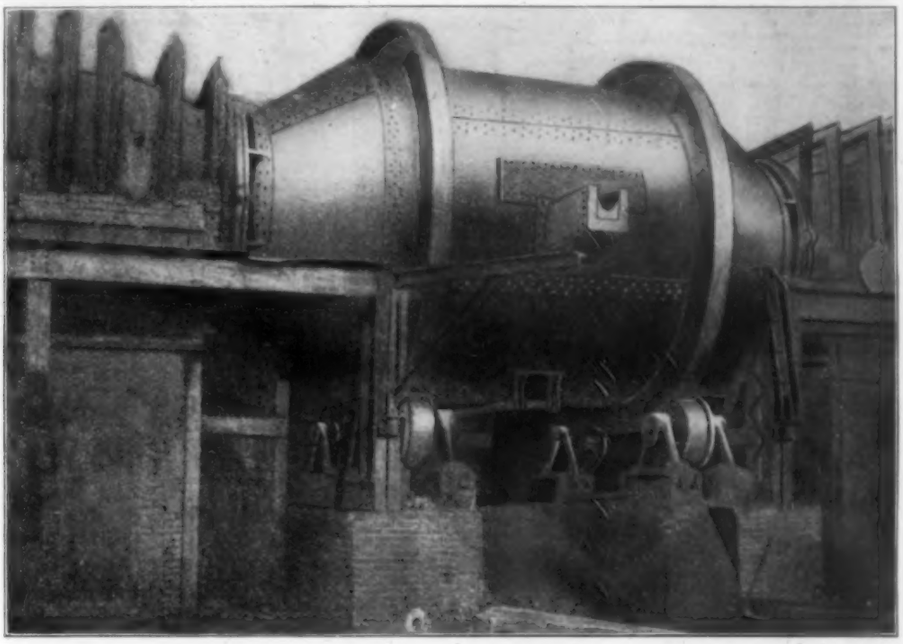


FIG. 2.—THE CAMPBELL TILTING OPEN-HEARTH FURNACE.

"You have been called together to hear what must prove to be a most unwelcome report, and yet, one which I presume is not entirely unlooked for by the most of you. I assumed the office of president a little more than one year ago to relieve the then president, who owing to his removal to New York, was unable to attend to the duties of the presidency. It was supposed at the time I assumed these duties that the only thing before the company was the mining of ore. The plant was practically completed or provided for, and the company was shipping ore at that time. Every one connected with the enterprise supposed that we had or were about to enter upon an era of prosperity, in which every one connected with it would be repaid in a very handsome manner. Unfortunately it was found that the outcroppings of ore proved most misleading and every indication pointed to the early exhaustion of all the ore. Every energy was directed to examining and developing every indication of a mineral deposit, both on our own territory and adjacent territory wherever it could practically be used in connection with our plant, but all our efforts

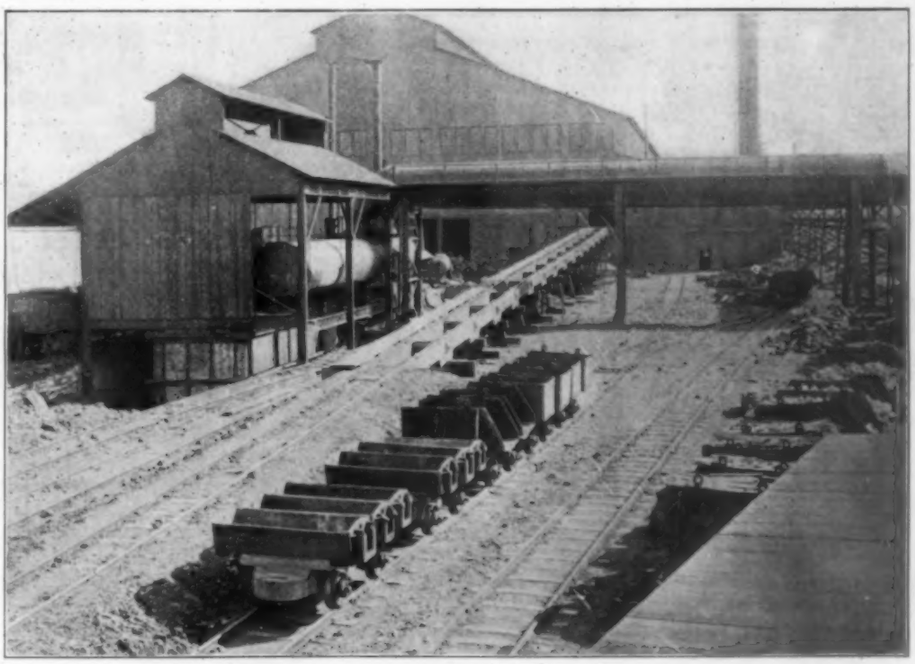
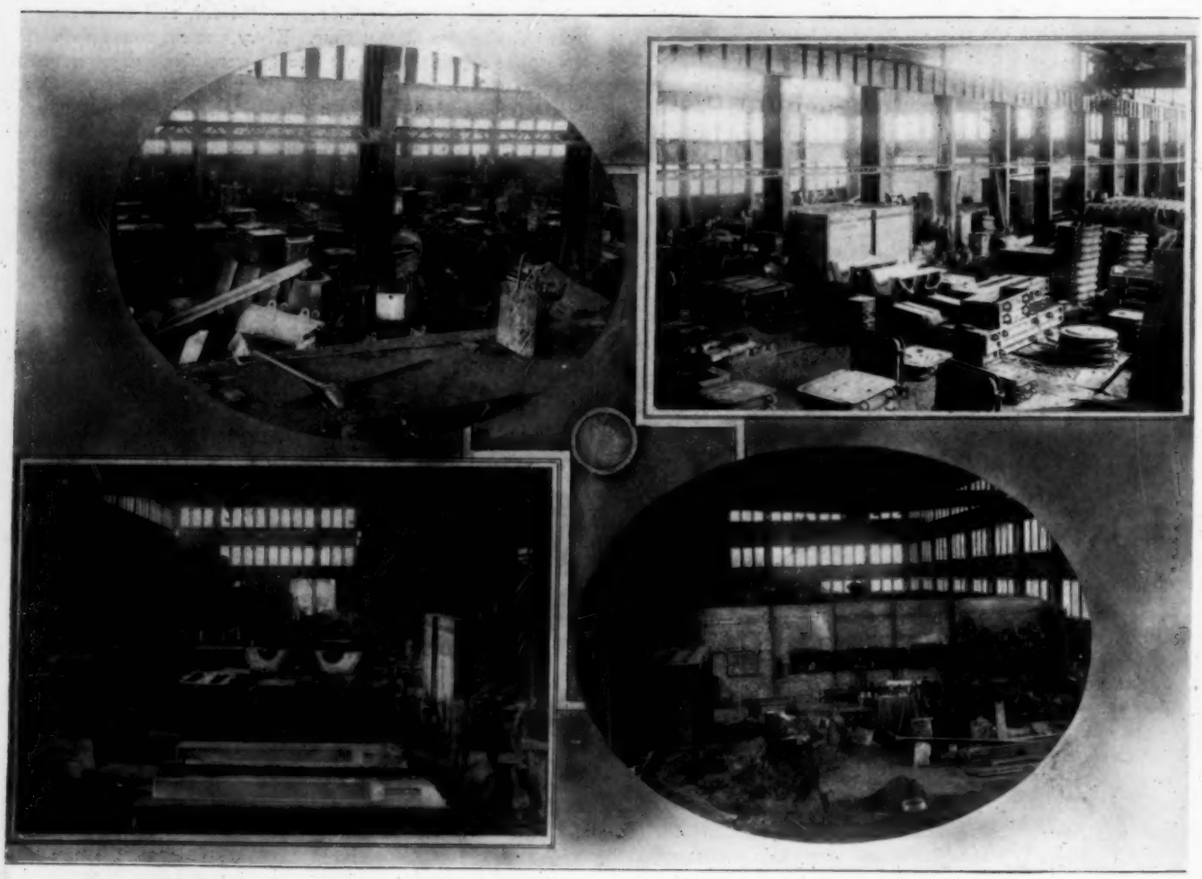


FIG. 3.—TRACKS AND CARS FOR HANDLING MELTING STOCK. GAS PRODUCER AT THE LEFT.

have proved unsuccessful. In view of this unfortunate condition a brief review of the history of the enterprise will be of interest.

FIG. 4.—THE FURNACES AND CASTING PIT WITH SPECIAL INGOT MOLDS.

"The company was incorporated under New Jersey laws in June, 1899, and took over leases of the Guama and the Bayamita groups of iron mines, located 35 to 45 miles west of the city of Santiago de Cuba. These properties were reported upon favorably, but particular examination was made of those first mentioned—the Guama group—by experts of great experience, and the mines were personally visited by Edgar C. Felton, the president of the Pennsylvania Steel Co., Luther S. Bent, the vice president of the company, both of whom were largely experienced in Cuba mines. It was also visited by your former president, Mr. Dick. Besides we had reports from Mr. Ziegenfuss, who was the general superintendent of the Juragua mines, so that from every quarter and from the most reliable sources we were informed that this group of mines was very valuable. Indeed they were thoroughly believed at



A CORNER OF THE MOLDING FLOOR. ASSEMBLING FLOOR. FIG. 5. ANOTHER SECTION OF THE FOUNDRY. CORE OVEN FOR SMALLER CORES.

the time to be most valuable ore deposits. That they were so regarded outside is also true from the fact that representatives of both the old iron companies operating in the district of Santiago endeavored to obtain control of them in 1898. Another important fact, showing the faith of the management in the enterprise, is this: of the $1,300,000 cash invested in the plant and equipment, about 80 percent thereof was put in by the directors and by the corporations which they represented. This indicated how thoroughly they believed in the enterprise and its future.

"Statements of the difficulties and delays experienced in the construction work owing to necessary changes in railroad line and in the method of building the shipping pier, causing increased cost over the original estimate, which necessitated the placing of a mortgage of $750,000 upon the property; and owing to the several changes in general managers in Cuba by reason of sickness or death of the incumbents, need not be repeated here as they have been fully rehearsed in preceding reports, suffice it to say the very complete and substantial mining and railroad plant was finished in good working order and the first cargo of ore was shipped in May, 1901.

"All the mining has been done on the Guama group, as the lease of the Bayamita group was cancelled and given up in August, 1901, owing to a most unfavorable report both as to their value and their accessibility by our experts in Cuba. The total product has been 40,000 tons of ore; of which 38,000 tons, comprised in eleven cargoes, have been shipped to the States, and 2,000 tons remain on hand in Cuba awaiting shipment. The average analysis of the eleven cargoes shows 61.877 percent metallic iron; and the selling price has ranged from $2.75 to $3.50 per ton f. o. b. vessel at Cuban port of shipment, the present price of about $3.40 being higher than any ever realized by other companies on shipments of Cuban iron ore.

"The quality therefore and the market have been all that was expected or that could be desired, and as an indication of what the results would have been had the mines turned out as estimated, it may be stated that on a product of 350,000 tons per annum (which was the quantity counted upon) the profit would have been not less than $700,000 for the first year, or sufficient to pay off half the mortgage debt with 7 percent dividends on both preferred and common stock and still leave a surplus of $140,000. But unfortunately such satisfactory results could not be realized because the quantity of ore has been proven to be lacking.

"There have been discouragements and disappointments in the development of one mine after another almost from the beginning of shipments, still we have worked on persistently and hopefully, and even as late as December last the directors were still reasonably sure of having in one mine at least a large and valuable deposit of ore. But the end of January brought report that this last hope like the others was showing up badly, and the prediction from our officers in Cuba that 6 months more would see all the ore taken out which it was possible to mine economically. Expenses were at once reduced to the lowest possible limit; the condition of affairs was frankly stated to our few creditors, an extension of 6 months obtained on their outstanding accounts, and work was continued in the hope that in mining out the small quantity of ore in sight something better might develop. Such hope has not been realized. On the contrary the predictions of our officers have been verified, all the ore has been mined, the last cargo is now awaiting shipment, and dismantling of the property and removal of all equipment to a point near the shipping port, is now in progress.

"Most exhaustive examinations have been made by our experts in searching for new mines both on our own property and in all the sections which would be tributary to our railroad and shipping port, but all their efforts have proved of no avail, for, although hopes have been repeatedly raised by the finding of small outcroppings, in every case the deposits have proved to be of no considerable size or value. As the directors themselves, who have had the management of the company's affairs, are by far the heaviest personal losers by its collapse, other stockholders may rest assured that no stone has been left unturned which would have tended to make the enterprise a success, and it is only by force of compelling circumstances that it is now reluctantly declared to be a failure.

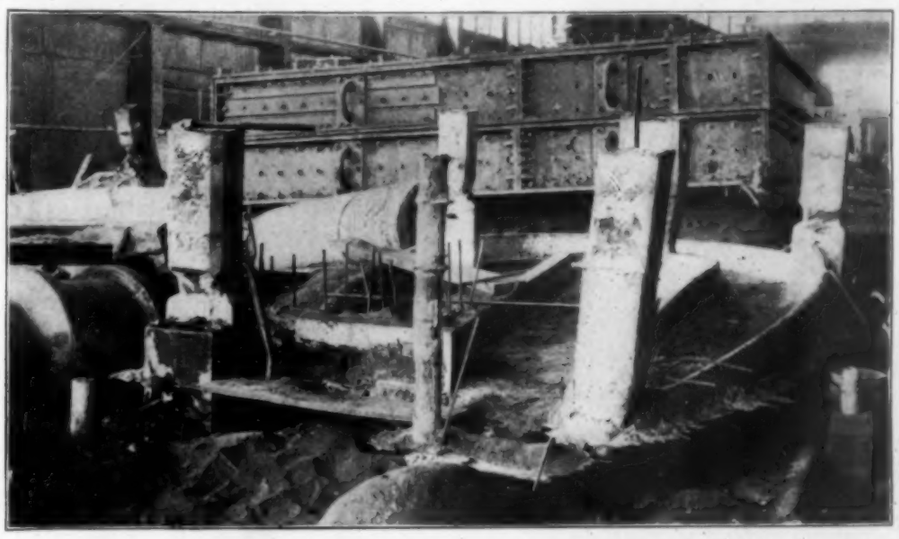


FIG. 6.—A LARGE STEEL CASTING AS IT LEFT THE MOLD.
(The long and heavy Sink-Heads give an idea of what is necessary to produce solid steel castings.)

Not a man connected with the management has ever reaped a single dollar of profit, and the presidents have all served without compensation, so that we can only regard this as an unfortunate collapse of a purely business venture, and that through a wholly unforeseen and unavoidable condition.

"The mines themselves being valueless, all that is left on which anything can be realized, are the steel rails, bridges and pier, the railroad and other equipment, and the real estate, and it is recommended that the Girard Trust Co., trustee under the mortgage, be asked to take possession under the terms of that instrument and close up the affairs of the company in the interest of all concerned."

Holders of 225,000 of the company's stock, the total of which is 300,000 shares, voted to wind up the company's affairs. Holders of 500 shares voted against it. The company began business in 1899. About $1,300,000 was invested in it, of which the Pennsylvania Steel Co., as stock and bond holder, put in 50 percent, and the directors of the ore company 30 percent.

The American Shipbuilding Co. has closed a contract with the Zenith Steamship Co., of Duluth, for a large new freighter to be built at the Globe plant in Cleveland and completed about July 15, 1903. The cost will be $285,000 and the vessel will be 416 feet keel, 50 feet beam, 28 feet deep and will have 12 hatches with 24-foot centers. Construction will be on a new plan for the convenient operation of clamshell buckets. The new boat will have triple expansion engines and two Scotch boilers.

PORT HURON AIR MOTORS AND DRILLS.

The illustrations show a line of pneumatic apparatus recently designed and manufactured by the Port Huron Air Tool Co., Ltd., of Port Huron, Mich. The firm is a comparatively recent organization and has been formed with the intention of bringing out special designs in air driven mechanism and practically applying them to jib cranes, stationary motors, traveling cranes, etc.

The Port Huron motor consists of a couple of oscillating cylinders, each double acting and set at right angles in an air tight case as shown in the interior view of the motor seen in Fig. 1. There is no movable valve mechanism as the oscillation of the cylinders opens and closes the ports and causes a sharp cut-off. A small quantity of oil is kept in the case so that the crank splashes the lubricant upon the valve seats and the air carries it through the inlet ports to the pistons. All motors are reversible and those of the same size and type are interchangeable. It will be noticed that the cylinders oscillate from the extreme end. There are eight ports to each engine. When the engine is on the dead center the air is shut off. Four of the ports of each cylinder head operate at the same time, two feeding and two exhausting so that when the engine turns off the dead center the feed and exhaust ports open and when the engines are on half stroke the ports are wide open and then

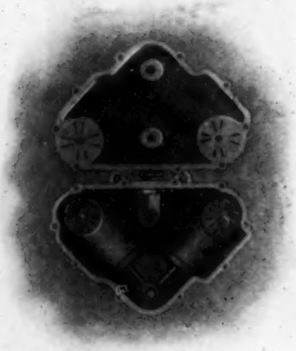


FIG. 1.—INTERIOR VIEW OF THE PORT HURON MOTOR.

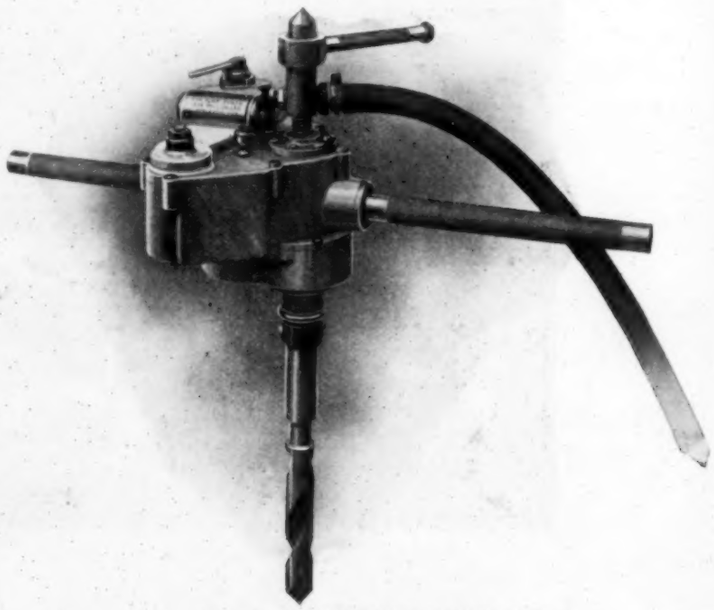


FIG. 2.—PORT HURON PNEUMATIC DRILL.

gradually close until the dead center is reached and the cycle of operations commences anew.

The cylinder head is a bronze casting and the cover is cast iron on all motors. The cylinder heads in the drills are bronze castings whilst the covers are made of aluminum with steel bushings. The two wearing surfaces are thus of different metals and are scraped to a surface plate and the engines are all tested under pressure and sent out perfectly tight. The cylinder rocks on a trunnion which is stationary with a spring under the lock nuts on the cover. The spring is made strong enough to take up all wear that may come on the two faces. The bearing fits on the pin for the full width of the box and the oscillation is so small that it takes proportionately about six turns of the crank shaft for one turn on the trunnion. Every bearing is bronze bushed and the shafting is made of high grade steel.

The drills, illustrated in Fig. 2, are made with aluminum cases. The drill is readily reversed by a three-way valve. When the tool is employed in boiler tube work, the reverse movement is of great convenience in contracting the expander for the next operation. The gear box is interchangeable so that the tool can be made to tap holes up to 1½ inches by a variation in the gearing ratio, the spindle speed being from 30 to 40 turns per minute.

The motor illustrated in Figs. 3 and 4 is gearing for attachment to a jib crane or derrick and may be applied in a similar manner to locomotive turntables or the running of any individual machine. A 4-ton air motor hoist is shown in Fig. 5. The motor handles the load through straight line gearing at the rate of 12 feet per minute. The company claims that the hoists will lift as much again as the catalogued capacity and that the hose may be disconnected and the load held indefinitely without the use of any additional brake. The valve is operated by two chains reaching to within four feet of the ground and by this means the motor may be instantly stopped, started or reversed. The valve is self closing when the chains are released. The hoist is made with a winding drum and equipped with a wire rope, with double or triple sheaves and will lift from one to ten tons. Twenty-four of these stationary motor hoists (as illustrated by Figs. 3 and 4) are in use by the Bass Foundry & Machine Co., of Fort Wayne, Ind.

Burnham, Williams & Co., Philadelphia, advise us that there is no foundation for the rumor, which has been widely published, that they are looking for a new location for the Baldwin Locomotive Works.

The activity in the iron and steel business is encouraging efforts to develop iron ore at several points in the South which have long been neglected. Some ore is being mined in Hart county, Ky., and land in Greene county, Ky., has been leased to capitalists who expect to make explorations. Arrangements have been made to develop magnetic iron ore property near Blacksburg, S. C. Before the war these ores were extensively used in local iron works, but the shifting of methods and the drift toward greater sources of supply brought idleness to the mines.

The Pennsylvania Railroad Co. is making provision for its supply of locomotives for next year. The motive power department expects to put in service some 300 new engines in 1903. About two-thirds of these will be built in the Altoona shops. The Baldwin and American Locomotive Works have been asked what they can do in supplying the other third.

The Census Bureau has issued a pamphlet on the typewriter industry. It shows that in 1890 there were 30 establishments with a capital of $1,421,783 and 1,631 wage-earners, while in 1900 there were 47 establishments with a capital of $8,400,431, with 4,340 wage earners. The value of the products was $3,630,126 in 1890 and $6,932,029 in 1900.

At the convention of the International Union of Coremakers held in Cincinnati last week, a resolution was passed in favor of merging with the Iron Molders' Union of North America, subject to a referendum vote of the membership.

RECENT DEVELOPMENTS IN THE GAS ENGINE*

BY PROF. T. HUDSON BEARE.

Use of Blast Furnace Waste Gases.

About 1894 attention began to be drawn to the possibility of using blast furnace waste gases in place of producer gas for working gas engines, and there is very little doubt that the

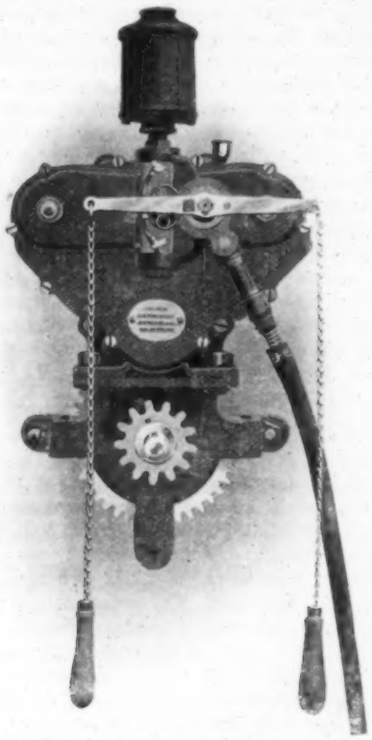


FIG. 3.—FRONT VIEW OF STATIONARY AIR HOIST.

idea was taken up at almost the same time in Great Britain, in Belgium, and in Germany. Mr. Thwaite, who was the first—in May, 1894—to propose such a scheme in England, was enabled in February, 1895, to fit up an Acme gas engine at Wishaw, at the Glasgow Iron & Steel Works, where it drove a

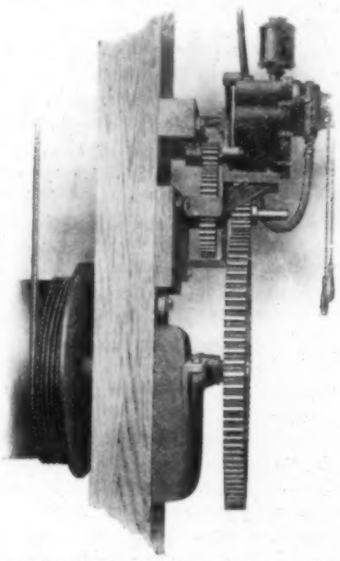


FIG. 4.—STATIONARY MOTOR APPLIED TO JIB CRANE.

dynamo. This engine had a 12-inch cylinder with a 20-inch stroke; it ran at 190 revolutions, and generated about 15 h. p., and was tested in August, 1896. The blast furnace gases used had a heating value of 126 B. T. U. per cubic foot, and contained 27.8 percent of combustible gas; the furnace at the time was supplying 170,000 to 180,000 cubic feet of such gas per ton of iron made. The engine used about 84 cubic feet of gas per horsepower hour; or, in other words, 1 e. h. p. was secured for 1.6 pounds of coal burnt in the furnace—that is to say, 1.6 pounds of coal in the furnace not only did the smelting work as before, but the otherwise waste gases from this amount of fuel were able to give in addition 1 e. h. p. The fuel in this blast furnace was coal, and, therefore, the waste gases had to be purified from ammonia and tar before they could be sent to the gas engine. This somewhat complicated the process. The next attempt in England was in 1897, at the Frodingham Works, where a 15-h. p. Acme was set to work with a waste gas of a heating value of 102 B. T. U. per cubic foot. This

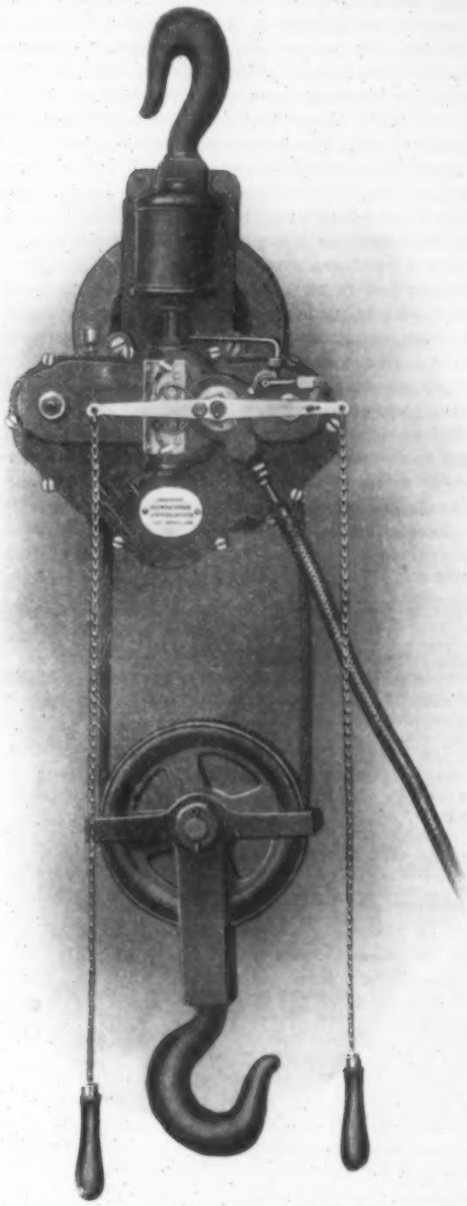


FIG. 5.—4-TON AIR MOTOR HOIST.

engine ran with a consumption of 110 cubic feet per horsepower per hour.

The development in England, however, of the utilization of blast furnace gases has been somewhat slow, and our enterprising rivals across the North Sea have been much quicker in taking up this question than we have been in Great Britain. There are, however, a 400-h. p. Thwaite-Gardner engine at the Clay Cross Ironworks working a vertical air blower; a 500-h. p. Crossley at Wolverhampton, driving direct air blowing cylinders, the engine cylinders (there are two, working on the same crank pin) being 31 inches diameter and the stroke 36 inches, and the speed 130 revolutions a minute; and

*Extracts from a lecture delivered to the Graduates' Section of the Institution of Mechanical Engineers, England.

a 600-h. p. Seraing type engine is now in process of erection at Middlesbrough.

In Belgium the first idea of the utilization of blast furnace gases was due to the Cockerill Co. This company was at that time about to embark in the manufacture of gas engines, and eventually decided to adopt the Simplex single-cylinder 4-cycle engine, with electrical ignition. This type of engine, as it happened, was very suitable for experiments on the utilization of blast furnace gas, as, in order to work with a high compression, the end of the cylinder had been carefully rounded inside, thus doing away with all sharp corners and edges where dust could collect and cause trouble. Ignition in this engine is obtained by means of a slide valve, the electric arrangement securing a continuous stream of sparks in the ignition chamber, and then at a certain definite time the slide valve puts the cylinder in communication with this ignition chamber. The engine also has special arrangements in regard to the inlet valves. There are two—one for air and one for gas—opening into a mixing chamber, and from this chamber the mixed charge passes into the cylinder by means of a third inlet valve, which is water jacketed and is the only one of these inlet valves subjected to the direct effects of the explosion. An 8-h. p. engine of this type was set to work in 1895, and ran for a considerable period of time, using gas from the blast furnaces, the quantity of gas used being about 187 cubic feet per horsepower hour.

The company were so well satisfied with the result of this experiment that in 1898 an engine of 150 b. h. p. was put down to work an air compressor. This engine was tested by Prof. Witz in 1898, and was found to have a thermal efficiency of about 20 percent, the compression pressure adopted being 114 pounds per square inch. In November, 1899, a larger engine, rated as a 600-h. p. engine, was erected, and this has also been most carefully tested both against a brake and when working the air compressing cylinder. This engine has a cylinder 51 inches diameter, with a 55-inch stroke, the air cylinder having the same stroke and a diameter of 67 inches; the motor plunger piston is jacketed as well as the cylinder barrel and end.

Results of Tests when Driving Blowing Cylinder.

Indicated horsepower	886
Brake horsepower (deducted from work done in compressing air)	725
Revolutions	93
Mechanical efficiency	81 percent.
Compression pressure	250 pounds absolute.
Heating value of the blast furnace gas per cubic foot (lower value)	99.7 B. T. U.
Gas used per brake horsepower hour.	101 cubic feet.
Thermal efficiency on the indicated horsepower	31.2 per cent.
Thermal efficiency on the brake horsepower	25.3 per cent.

The compression adopted in this engine was 135 pounds absolute. It should be stated that the heating value of the fuel was determined experimentally, both by a Junker calorimeter and also by a bomb calorimeter, and it also was in addition calculated from the chemical analysis. The mean results varied from 99 to 111 B. T. U. per cubic foot, the lower value being given by the Junker calorimeter.

In Germany the first attempt at this utilization of blast furnace gases was in 1895, at the Hörde Ironworks, in Westphalia, where a 12-h. p. Otto type of engine was tried, the compression being 6½ atmospheres. So satisfied again were the users with the result that they determined to proceed with the experiments, and they adopted as their type of gas engine the Oechelhauser 2-cycle gas engine, which has only so far been used with blast furnace gases. The arrangements of this engine are somewhat like those of the Atkinson differential gas engine. There is one long horizontal water cooled cylinder in which there are two pistons working in opposite directions; the front piston is attached by its connecting rod to a crank set at 180 degrees to two other cranks, which are driven by connecting rods attached to the crosshead of the back piston. This back crosshead also works the piston of a double acting air pump, delivering pure air on one side and mixed gas and air on the other. There is no cam shaft and practically no valves, the pistons themselves open and close the admission and exhaust, the exhaust being so arranged as to prevent any possibility of any of the exhaust gases remaining in the cylinder to mix with the fresh charge. The cycle of this engine is as follows: The two pistons being as close together as possible, and the space between them being filled with a mixture of gas and air at a pressure of about 135 pounds absolute, the charge is fired electrically, and both pistons move out, making their working stroke. As the main pistons reach the end of their out stroke the front one uncovers the exhaust openings, and the other immediately after uncovers a port through which clean cool air at a slight pressure enters the cylinder; this acts as a scavenger charge to sweep out all the remains of the previous burnt charge; next, the same piston opens a second port by which the compressed charge from the air pump enters the cylinder, driving out the scavenging air. On the return stroke of both pistons the ports are closed and the charge is compressed, ready to begin the cycle again. The cylinder is most carefully water jacketed, and the scavenging air at Hörde is supplied from the blowing engines driven by the gas engine. The cylinder for an engine designed to give 1,000 h. p. is 36.8 inches diameter, and the 600-h. p. engine has two 300-h. p. cylinders, each 19 inches diameter by 31½-inch stroke, running at 135 revolutions. The Deutsche Kraft Gas Gesellschaft are now making very large engines of this type—engines to give 1,000 h. p. with a single cylinder—and they have proposed to construct a 2,000-h. p. single cylinder engine.

Dust in Blast Furnace Gas.

One of the main difficulties which had to be overcome in the use of blast furnace gases for gas engine work was the removal of the dust which was carried out from the blast furnace along with the gases. It was thought at first that much trouble would also be caused by the considerable variation in the composition of the gas and by its high temperature; but both these latter difficulties turn out in practice to be of no great importance. The variation in the composition is prevented by mixing the gases delivered from several furnaces, and as a result the average composition does not vary to any marked extent, and as the proportion of H present in the gases is small, a small variation makes but little difference. The high temperature difficulty is also got rid of by the cooling, which is brought about in the process of cleansing the gases from the dust; the dust is mainly metallic particles mixed with lime; a certain amount is deposited in the exhaust mains as they pass from the blast furnace.

In connection with the trouble experienced from the dust in the blast furnace gases, attention may be drawn here to a paper read by M. Greiner before the Iron and Steel Institute in May, 1901. M. Greiner stated in that paper that the Cockerill Co. had had a 200-h. p. gas engine running at Seraing for 3 years, since 1898, which has never required the cylinder to be cleaned once on account of the dust, though the engine ran night and day, and the blast furnace gases were used entirely without any purification, and that a 600-h. p. gas engine at the same works, also using unpurified gases, had so far given no trouble.

On the other hand, at Differdingen, where the Cockeriil Co. were putting up nine 600-h. p. gas engines, great trouble had at once been experienced, due to the fact, as was ascertained on making investigation, that the blast furnace gases at Differdingen contained on an average from 4 to 5 grammes of dust per cubic meter, while at Seraing the proportion was not more than 0.25 to 0.5.

M. Greiner instituted an inquiry into the variation of dust in blast furnace gases, and came to the conclusion that with furnaces using hematite ores, as a rule, the amount of dust was small, but where oolitic ores were used a great deal of dust was carried forward, even when the gases passed through long lengths of pipe before they reached the point where they were utilized, and that it was impossible to separate the dust by using long lengths of pipes or any other such simple plan; the dust was in such a fine state of division that it was readily carried forward. He said there were at present practically two plans in use for cleansing the gases: one, which may be called the "static system," where the gases are passed through a series of scrubbers (which are sheet iron towers containing coke or sawdust cooled with water spray), a plan due to Mr. Thwaite, to whom so much of the credit for the use of blast furnace gases belongs; and the other, which may be called "dynamic," where the gas is passed through an ordinary

centrifugal fan, into which a jet of water enters at the axial part. The latter was the more convenient for use at Differdingen, and, apparently, experience has shown that the expectations formed as to its working have been justified. The plan adopted there was to use a fan about 60 inches diameter, running at 900 revolutions a minute; through this the gases passed, drawn in by the central aperture, and a stream of water also enters the axial part through a pipe about 1 inch diameter; the gas is driven out through the ordinary discharge, and the dust and water pass away in a 2-inch pipe, taken off from the lower part of the casing. Examination of the gas showed that before entering the centrifugal fan it contained as much as 4 grammes per cubic mèter, and after passing through only .25 of a gramme, and it was then in a fit state for use in the gas engines. The water used amounted to about 1 to 1½ litres per cubic mèter. It was stated that the total cost of this apparatus for dealing with the amount of gas which would be required for six 600-h. p. engines was only £400, and M. Greiner strongly advocated the adoption of a similar plan for purifying the blast furnace gases, even when they were only burnt in heating stoves. It should be mentioned, however, that in the discussion on this paper a good deal of scepticism was expressed mainly by English iron and steel experts as to whether purification by this simple process would prove successful in the long run. It seems to have been satisfactory so far, where it has been tried.

Heat Value of Blast Furnace Gases.

The heat value of blast furnace gases necessarily varies very much with the type of furnace, the rate of working it, and the proportion of the charges and various other conditions. As a result of a series of analyses of blast furnace gases in England, Belgium, and Germany, it appears that about 28.8 percent of the gas is carbon monoxide, about 2.5 percent hydrogen, about 7.25 percent carbon dioxide, and about 61.3 percent nitrogen. If a blast furnace is in good work as regards the reduction of the metal, the more CO_2 in the exhaust gases the better, and, of course, this is a distinct disadvantage when the waste gases are used for gas engine work. The heating value per cubic foot ranges from about 105 to 115 B. T. U., using the higher value for the hydrogen constituent; but as the proportion of hydrogen is comparatively small in these gases, there is not much difference in the heating value, whether we take the higher or lower values for the hydrogen.

Opinions differ very much as to the probable amount of power available by the utilization of blast furnace exhaust gases, and probably some of the estimates that have been made are somewhat rash.

Mr. Lürmann, the German authority, expressed the opinion that of the total gas produced in blast furnaces about 10 percent was lost in leaks in the pipe and in the smelting; about 28 percent was required for heating the blast, and that in most iron works at the present day about another 40 percent was used for the generation of steam. This left about 22 percent passing to waste, and he estimated that there would be about 28 h. p. hours available per ton of iron smelted if this waste were utilized in gas engine work. To take one example, at Seraing, where about 600 tons of iron are made a day, there was waste gas sufficient to develop 17,000 h. p.; and in Germany, as a whole, where 7,400,000 tons of pig are made a year, he estimated there is available some 570,000 h. p. Whatever opinion we may have as to these figures, there is no doubt that this plan of making use of gases which were previously to a considerable extent wasted, is bound to have a great future. In a paper read last March before the German iron masters at Düsseldorf, Mr. Lürmann gave some statistics as to the amount of power now being developed in Germany from this source; at that time it amounted to a total of 44,000 h. p., which is a somewhat remarkable record, when it is remembered that it is only 5 years since the idea was first mooted. In Belgium, France, and Italy there were engines developing about 17,000 h. p. at work.

Increasing Use of Blast Furnace Gas Engines Predicted.

Although it is never safe to prophesy, it is as a rule, pretty safe to forecast future lines of development in engineering practice by carefully watching the present trend; and I do not think, therefore, I shall be too rash if I forecast for the utilization of blast furnace gas a very remarkable future in this country.

In America, in place of the large engines using producer or blast furnace gases, we have the Westinghouse 3-cylinder type of engine using natural gases. Until quite recently—owing probably to the high price of coal gas—the gas engine had not met with much success in the United States; but since the question was taken up by such an energetic company as the Westinghouse Co., a complete change has been brought about. Large 3-cylinder gas engines, developing from 600 up to 1,500 h. p. on the brake, are now being extensively used in central station work in suitable districts. The heating value of this natural gas being about 1,000 B. T. U. per cubic foot, it is a comparatively easy matter to govern these engines by controlling the richness of the charge, and thus insure very steady running conditions. I have not been able to find any very complete records of lengthy tests of this type of gas engine, but the heat efficiency when using about 10 cubic feet of gas per brake horsepower per hour appears to be 25 percent; a very good figure indeed.

In considering the future prospects of large gas engines the questions of freedom from breakdown and steadiness of running are most important. My own experience, extending now over a period of 12 years, is that in the smaller sizes the gas engine is singularly free from breakdown troubles, and costs but a merely nominal sum annually in repairs, even when you work the engine under a heavy and constant load. For larger engines we now have equally strong testimony from those who have used them, the long period during which the large engines at Seraing have run without any need of repairs, and the testimony of Mr. Humphreys as to the long runs of a 60-h. p. nominal Crossley engine are fairly conclusive. This latter engine ran for 2 years for 96.6 percent of the whole possible time of running, and had actually run for 6 months, day and night, without a single stop, and this with only the most trifling repairs. Such evidence requires no comment from me; it is clear that gas engine makers, by careful attention to details and by extreme care in the jacket arrangements, are able to turn out large gas engines which will give as little trouble in working as the very best types of steam engines now on the market. As regards steadiness of running, we have again plenty of testimony. In the case of the two large engines at Winnington, already mentioned, the variation of speed was comparatively small; with the ordinary "hit and miss" method of governing the total variation was under 2 percent, and with the engine allowed to explode every possible time the variation was under 2-10 of 1 percent. It is clear that one of the chief obstacles to the more extended use of gas engines in central station work has been removed when such steady running as this can be guaranteed.

I cannot within the limits of this lecture deal with the question of relative cost of gas and steam engines, but all the figures I have been able to collect go to prove that the gas engine supplied with producer or blast furnace gases is a most formidable rival, even to the finest high speed steam engine, while my own experience convinces me that for driva small workshop, where the power used fluctuates a good deal, the small gas engine, even using town gas, is much more economical than a similar sized steam engine and boiler. I would refer for further details to the elaborate cost figures given in Mr. Humphreys' paper and in several other recently published papers.

I cannot conclude this brief summary without some reference to the two valuable reports already issued by the gas engine research committee of the Institution of Mechanical Engineers, though, of course, it is quite out of the question that I should attempt to summarize two papers which are themselves a condensed account of experiments lasting for many months. I would merely say that the difficulties already encountered in measuring the temperatures in the cylinder show how extremely difficult this problem is; and until some knowledge is available as to how the temperatures vary throughout the mass of gas present at any instant in the cylinder, I am afraid that the use of these measured temperatures in any calculations as to loss or gain of heat during expansion or compression is liable to quite as serious errors as those introduced by the assumptions made by Dr. Kennedy in connection with the Society of Arts' trial. When one remembers

that it is the temperature absolute which is used in these calculations, an error of even 50 degrees F. in the accuracy of the temperature at the instant that compression begins does not seriously throw out the final results, nor does the assumption of uniformity of specific heat; comparing the specific heat at constant volume of nitrogen at 1,000 degrees F. with that at 32 degrees F., the increase is only some 7 percent, and, therefore, the mean specific heat over the range differs by a still smallr percentage from the usually accepted value. As long, therefore, as we have to depend either on measured temperatures when we can only measure it at one point of the mixture, or on calculations based on an analysis of exhaust gases in order to determine the temperature of the mixture at the point when compression begins, it appears that we may still safely continue to use the older approximate methods, especially when the engine has good scavenging arrangements, and none of the burnt charge remains in the cylinder.

It is interesting to note in the last report of the committee that the increased efficiency due to raising the compression pressure before firing from 55 pounds to 124 pounds amounted to 2.7 percent, or an increase of about 20 percent. The figures below, extracted from the report, show the gradual increase in efficiency:

Compression Pressure.	Efficiency of B. H. P.
55	13.2
71	14.0
93	13.4
124	15.9

EASTERN PENNSYLVANIA.

HARRISBURG, Pa., Sept. 15.—Eastern Pennsylvania furnaces and works are feeling the great coal strike and the freight congestion worse than ever. Plants are being compelled to suspend and to refuse deliveries on valuable orders simply because of inability to purchase fuel and supplies. Coal and coke can hardly be bought and furnaces are being banked daily.

Interview with prominent iron and steel men reveal a good outlook for the winter and many orders have been placed. The Pennsylvania Steel Co. has enough orders to run half a year and the Central Iron & Steel Co. has numerous plate orders.

Interesting suits have been in progress at Lebanon within the last few days. The American Iron & Steel Mfg. Co., which has been endeavoring to operate its plants in spite of strikers, has sued a number of men on charges of interference with workmen. The Lebanon situation is worse, from a fuel standpoint, than that in Harrisburg. Several of the largest furnaces have been banked.

The Paxtang Electric Co., of this city, has let contracts for engines to the Fulton Iron Works, of St. Louis; for boilers to the Babcock & Wilcox Co., of New York, and for electrical equipment to the Westinghouse company. The company's plant will cost half a million.

An interesting state report issued here within a few days shows that Pennsylvania produced 1,406,532 tons of steel rails; 1,590,502 tons of plates and other rolled products amounting to 5,633,594 tons, a total of 8,668,337 tons, valued at $298,284,259. Allegheny county leads with 5,095,608 tons; Dauphin county, the Harrisburg-Steelton district is second with 497,000 tons and Cambria third with 443,605 tons.

The Central Iron & Steel Co., of this city, has let the contract for its new open-hearth steel plant building to the Pennsylvania Steel Co. The Pennsylvania Steel Co. will also build the new bridge of the Harrisburg Bridge Co. over the Susquehanna. It is estimated that the cost of the bridge will run into the hundreds of thousands of dollars.

The Perry forge at Marysville, near Harrisburg, has been started. It is one of the few forges left in this part of the State and will be run on charcoal blooms.

One of the puddle mills at Milton was damaged by a wind storm a few days ago and had to suspend operations. All of the works at Milton are busy and enjoying unusual work.

The Keystone Wagon Co., of Reading, will add $100,000 to its $300,000 of capital stock for the sake of improvements.

The Reading foundries are increasing their forces of employes.

The Norway Iron & Steel Co., of York, will issue $300,000 of capital stock to make improvements to its works. That will give it $600,000 capital. The York founders are buying Scotch pig iron owing to inability to get domestic iron at prices equal to the foreign rates. A. B. H.

A NEW PIPE WRENCH.

A patent has recently been allowed Axel Dahl, of North Tarrytown, N. Y., for an adjustable pipe wrench. The wrench is illustrated in figs. 1 and 2, the former showing the complete wrench from a photograph while the other view is prepared from a line drawing of the working parts. The adjustable jaw *a* is held in contact with the operating handle *b* by means of a steel stirrup *f* through which the former piece *a* slides. The two sides of the stirrup *f* are secured firmly together by rivets as at *c* and a pin *g* retains the operating handle in position in the slot. The adjustable jaw *a* as well as the stirrup *f* have a notched face at *d* so that both jaws may have gripping effects at four points in the circumference of the pipe. The adjoining surfaces of the shank *a* and the lever *b* have clutching teeth in order that the tool may be operated to firmly grip the pipe and on the outer part of the slot through *f* there is a spring *h* which tends to maintain the toothed surfaces in contact. A fulcrum is located in the space between the cheeks of the jaw where the operating lever is pivoted and placed in advance of the pivot, the toothed face of the lever being reduced to favor unlocking the teeth when this is necessary in handling the work.

FIG. 1.—A NEW PIPE WRENCH.

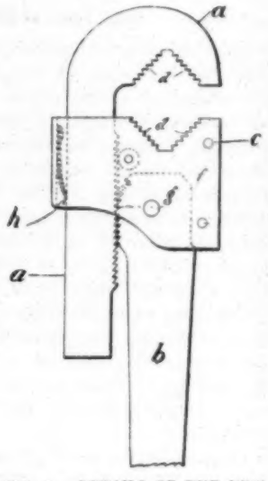


FIG. 2.—DETAILS OF THE NEW PIPE WRENCH.

New Bessemer Capacity for Jones & Laughlin Steel Co.

The Jones & Laughlin Steel Co., of Pittsburg, is installing an additional Bessemer converter at its South Side plant. The Bessemer department already contains two 10-ton vessels and by the addition of a third vessel of the same capacity the output of Bessemer steel will be increased 50 percent. It is probable that the additional converter will make its first blow about the middle of October. The Bessemer department at present has an output of 1,600 tons daily and with the third vessel in operation the daily output will be increased to 2,400 tons daily. During the past six months this concern has greatly increased its steel output both by the erection of basic open-hearth furnaces and by the building of the largest Talbot furnace in the world. While considerable difficulty has been experienced in bringing the output of the latter to its estimated capacity, there is now every indication of success. With the new steel producing capacity in full operation the annual output in gross tons of steel ingots, will be increased to 1,200,000 tons. The 40-inch blooming mill under erection at the South Side plant will be placed in operation in about two months and it is for the purpose of providing steel for this mill that the additional steel capacity has been added. The Soho furnace, located on Second Ave., was blown in this week, after an idleness of nearly two months. The furnace has been relined and a skip hoist has been erected.

LAKE SUPERIOR IRON MINES.

Mesabi Range.

The large Burt and Day stockpiles, north of Hibbing, have been cleaned up, and that of the Sellers, adjoining, will be all out in two weeks. The three contained 250,000 tons. The Hull piles are rapidly going. These were very large.

At the Duluth mine of the Minnesota Iron Co., adjoining the Biwabik on the west, a large stripping job will be commenced this fall. The milling system is employed here. The ore area extends westerly some distance and this new ground will be mined by the same process as the present opening. All the mine's product has been sent for several years to Jones & Laughlins.

It is the intention and hope of the Duluth men who have bought the wreck of the whaleback steamship Thos. Wilson, to raise both ship and cargo, the latter consisting of about 4,000 tons of No. 2 Adams ore. They will sell the ore to the Duluth Furnace, which is now running, or will ship it East.

The Kinney mine, one of the Mesabi properties of the Republic Iron & Steel Co., is being rapidly stripped and, it is predicted, will make a good shipping record the coming year.

The Wills will be the name of the new mine comprising the McKinley townsite, operated by the Wills Mining Co., of which A. W. Thompson, president of the Republic Iron & Steel Co., is president; E. D. Parmelee, superintendent of the Republic Iron & Steel Co.'s Mesabi holdings, is manager, and A. W. Maitland is secretary and treasurer. The mine has a proven ore body of 1,500,000 tons, as shown thus far.

From the Mesabi range leading mines have shipped about as follows: Fayal, 1,200,000 tons; Adams, 1,200,000 tons; Stevenson, 750,000; Mahoning, 800,000; Mountain Iron, 775,000; Hibbing group of the Minnesota Iron Co., 1,500,000; Genoa, 300,000; Roberts, Kanawha and Hale, 90,000; Auburn, 30,000; Franklin and Union, 185,000; LaBelle, 30,000; Commodore, 50,000; Lincoln and Grant, 45,000; Duluth, 75,000; Sharon, 100,000.

The large stockpile of the Victoria, of the Republic Iron & Steel, that has been on surface for some years, is being shipped, and a steam shovel has moved there to commence loading out. The stockpile of Commodore that has been on surface for two or three years is all shipped, as is also the Day stock, that has been out for five years.

There is stocked at the new Hawkins mine of the Deering company about 10,000 tons and the railroad to the property is now railed to within four miles. The other Deering mine, at Hibbing, is shipping about 400 tons a day.

Pickands, Mather & Co.'s Properties.

Pickands, Mather & Co. are now operating the following mines in the Lake Superior region, covering all ranges but the Vermillion and Marquette.

MESABI.

Company.	*Mine.*	*Superintendent.*	*Location.*
Corsica Iron Co.	Corsica	W. P. Chinn	McKinley, Minn.
Hobart Iron Co.	Elba	W. P. Chinn	McKinley, Minn.
Hobart Iron Co.	Minorca	Jos. Roskilly	Virginia, Minn.
Sparta Iron Co.	Sparta	J. O. St. Clair	Sparta, Minn.
Malta Iron Co.	Malta	J. O. St. Clair	Sparta, Minn.
Crete Mining Co.	Utica	W. H. Downing	Hibbing, Minn.
Crete Mining Co.	Albany	W. H. Downing	Hibbing, Minn.
Crete Mining Co.	Troy	Jas. Reed	Eveleth, Minn.

GOGEBIC.

Odanah Iron Co.	Cary	L. M. Hardenburgh	Hurley, Wis.
Odanah Iron Co.	Windsor	L. M. Hardenburgh	Hurley, Wis.

MENOMINEE.

Verona Mining Co.	Mikado	G. S. Barber	Bessemer, Mich.
Verona Mining Co.	Baltic	W. H. Jobe, asst.	Stambaugh, Mich.
Verona Mining Co.	Caspian	W. H. Jobe, asst.	Stambaugh, Mich.
Verona Mining Co.	Vivian	C. E. Lawrence	Quinnesec, Mich.
Verona Mining Co.	Verona	C. E. Lawrence	Vulcan, Mich.
Hemlock River Min. Co.	Hemlock	C. E. Lawrence	Amasa, Mich.

The first mentioned eight of these are on the Mesabi range, and of the eight the Minorca, Utica, Troy and Albany are, or are to be, new shippers this year. The Minorca was bought three years ago, but was not opened until now, and the three remaining were bought this spring. They are all being actively pushed into the shipping lists. In addition to them the firm has an option on the Elizabeth, 120 acres of state school land in section 12, T. 57, R. 21, and will probably take the property at the $350,000 asked by the first lessees. There are 11,700,000 tons of ore shown on this land that will average 58 percent iron, some Bessemer and some not. The explorations have not been completed and more ore will probably be shown. If this is taken it will be opened another year. Pickands, Mather & Co. are among the heaviest shippers in the lake region outside of the United States Steel Corporation, and will be very much larger another year. Their great activity has come since the blast furnaces of the Lackawanna Steel Co. approached completion. Mr. C. H. Munger, of Duluth, is general manager of these mining interests.

The Stevenson mine in one day recently shipped 16,085 tons of ore, making a new record for this steam shovel property.

Menominee and Marquette Ranges.

Two new Prescott compound pumps, with a capacity of 800 gallons per minute each, have been added to the plant at the Pettit mine, Menominee range, and the work of again unwatering the mine, which is a Republic Iron & Steel Co. property, is under way.

The Spencer property near Norway, Mich., has been optioned to a company in the interest of Oglebay, Norton & Co., and will be thoroughly explored.

Supt. Felix A. Vogel, of the Florence mine, Menominee range, says the mine will ship 100,000 tons of ore this season, provided there are no serious delays on account of lack of cars or boats. Work on the new No. 4 shaft is satisfactorily progressing, though the undertaking is slow, and attended with danger. Forty feet is now timbered up.

Ore is again being shipped from the old Dunn mine, Menominee range, several carloads being sent out last week. The ore is being taken from the old open pit.

At the Negaunee mine, on Marquette range, the Oliver Iron Mining Co. has added to its force lately and is mining about 1,000 tons a day. The mine is in better condition than before the cave of January, and will be operated heavily for the coming year. The same company's new Hartford mine, which is a deep property, is being put in shape for work and will be a factor in next year's output.

Gogebic Range.

J. R. Thompson, superintendent for the Schlesinger mines on the Gogebic, has been appointed general manager for the Ashland Iron & Steel Co.'s mines also. The principal mine of this company on the Gogebic is the Yale at Bessemer.

A discovery of Bessemer ore of sufficient promise to warrant revival of mining has been discovered at the Colby mine near Bessemer. The owners, Corrigan, McKinney & Co., were considering abandoning the mine when their general manager, W. J. Richards, decided to go under the dike. He was rewarded by the discovery of a body of ore. The Colby was the first mine opened on the Gogebic range, being the original steam shovel mine. The Colby made its first shipment, amounting to 1,022 tons, late in the fall of 1884. The second year, 1885, 84,302 tons was shipped and the next season 257,432 tons. In 1888 the mine reached its maximum tonnage with a production of 285,880 tons. The lenses gradually grew smaller until the Penokee & Gogebic Development Co., which held the lease, stopped mining. For two years, 1893-95, the mine was idle. In 1895, the property was reopened by Corrigan, McKinney & Co. and in 1896 48,492 tons was mined. In 1898 the output was 152,875 tons, but last year only 23,475 tons was taken out and operations were suspended.

Vermillion Range.

Iron ore sent from the mines of the Vermillion range this year so far has been about 1,600,000 tons. The Pioneer and Chandler have each shipped about 500,000 tons, which is within 100,000 tons of the expected total from Chandler and within 75,000 tons of Pioneer's allotment. The Soudan mines of the Minnesota Iron Co. have shipped 215,000 tons, which is within 120,000 tons of the allotment and is 10,000 tons more than the gross record for last year, the smallest season since the property became a large shipper. Zenith has shipped about 120,000 tons, Savoy 185,000, and Sibley 50,000. These three mines have an allotment of 205,000, 300,000 and 85,000 tons respectively. The total allotment for the Vermillion range for the present season is, therefore, 2,100,000 tons. Most of the stocked ore has gone forward but there will be no difficulty in shipping from shafts all that remains to complete the estimate.

It would not be surprising if the Vermillion range in the

course of a few years, should send forward annually 3,000,000 to 4,000,000 tons a year, chiefly from the Ely district. The mines of that district are all in the control of the United States Steel Corporation and no better ores are found in the lake region, while the quantity now known to exist in the basin running easterly from the Chandler and including the Pioneer, Zenith, Sibley, Savoy and Silverman, is immense, how large no one knows, but perhaps several scores of million tons. The The Duluth & Iron Range road has been running a survey this year for a new line of road to these Ely mines, in order to cut off several miles of distance and some grades found in the present route around via Tower. The survey, as now located, leaves the present main line below Wyman, swings to the west around the new Stephens mine, in T. 58, R. 15, crosses the present line to Tower just north of Mesabi station and runs along the eastern extension of the Mesabi range through town 60—12. This will give a double track line to Ely, running empties up the present line and loads down the new, with a lessened distance of about 20 miles. The Duluth & Iron Range evidently figures on a very much greater ore business the coming year, for it is planning to order 500 steel 50-gross ton cars. It has this year been using a number of old cars of the Duluth, Mesabi & Northern, but these are now in generally dilapidated condition and it is doubtful if they would stand another season of hard usage.

Rods from the Continuous Mill at Duquesne.

The Carnegie Steel Co. will shortly be a factor in the wire rod trade. At the Duquesne bar mill, Duquesne, Pa., a large double rod reel is being installed and it will be placed in operation within a few months. The merchant mills at this plant, which are said to be the most modern in existence, roll rounds down to the size of wire rods, and it will be possible with the rod reels to produce rods whenever there is a falling off in the demand for the smaller sizes of rounds.

Andrew Carnegie Honored.

At the Düsseldorf meeting of the Iron and Steel Institute, Sept. 3-5, a number of important papers were read, two of them relating especially to iron and steel development in Germany. The excursions included visits to the Düsseldorf Exposition and the Krupp Works. The announcement that Andrew Carnegie had been chosen president of the institute for next year was received with enthusiasm.

Extensive Iron Mining Operations.

The Marion Steam Shovel Co., of Marion, O., has just booked an order for eight large Barnhart steam shovels to be delivered in the spring and summer of 1903 at Minnesota iron mines. This company now has more orders on its books than at any time in its history, and the iron mining industry contributes no small part.

Chas. W. Mouch, New Castle, Ind., has purchased all of the stock held by shovel consolidation in the Indiana Shovel Co., and is now sole proprietor of that company. Mr. Mouch also has his own handle factory and has machinery contracted for a rolling mill to furnish sheet steel for the shovel department and other concerns. He is also adding buildings to the shovel plant and by Jan. 1, 1903, when the rolling mill is in operation, will have a capacity of 400 dozen per day. He now manufactures a full line of shovels and spades.

The Standard Motive Power Co., of New York, has closed a contract with the Dover Land & Improvement Co. for the removal of its plant to Canal Dover, O. The company will manufacture locomotives, street car motors and automobiles.

The steamship Ping Suey, of the China Mutual Line, arrived this week at Seattle, Washington, with 2,900 tons of rails and structural material from Belgium, shipments having been made from Antwerp, Holland. The steamship Kintuck will also arrive shortly with a consignments of 3,000 tons of rails from the same place. The shipments are consigned to W. D. Hofius & Co., at Seattle, who have been doing a large importing business during the past six months.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in commnnication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Lumbermen's Tool Co., Ltd., of Cedar Springs, Mich., recently organized with a capital of $50,000, has elected the following officers: Chairman, Marshal D. Elgin; secretary, F. E. Burleson; treasurer, Arthur J. Lane; manager, Geo. S. Burleson. The members of the board of managers are Marshal D. Elgin, Fred. E. Burleson, Arthur J. Lane, Geo. S. Burleson, Edgar J. Adams. The company will build new works at South Boardman, Mich., and manufacture a full line of lumberman's tools and other forgings. It has now under construction by the Ajax Mfg. Co., of Cleveland, a forging machine and is in the market for engine, boiler, trip hammer, furnaces, planers, lathe and other machines necessary to equip a first class forging plant.

The Michigan Foundry Co., Ltd., of Kalamazoo, Mich., has been incorporated by George Polasky, Frederick J. Bremer and Godfrey J. Bremer. The company is incorporated for $20,000 and takes over the business of the Bremer Machine Co. of Kalamazoo. The manufacture of gasoline and steam engines is the principal business of the concern.

A company to manufacture gasoline automobiles is being organized at Grand Rapids, Mich., with a capital of $500,000.

The Columbus Screw & Machine Co., of Columbus, O., capital stock $15,000, has been incorporated to manufacture screws, machinery and machine appliances. The incorporators are Roy M. Melvin, Joseph B. Foster, John H. Harrington, Cornelius E. Nelson, Louis V. Kuhn.

The Milwaukee Modern Tool Co. has been incorporated. The company will manufacture the Gordon patent chuck. The capital stock is $50,000 and the incorporators are Charles Gordon, F. H. Hagerman and Hubert Atherton.

The Ohio Steel Wheelbarrow Co., Toledo, O., is buying machinery for its new plant.

S. G. Barker & Sons, scale manufacturers, are erecting a large plant in Scranton, Pa. There will be four buildings—machine shop, 65x100; blacksmith shop, 40x50; boiler house, 20x30, and office building, 30x40.

The Standard Mfg. Co., Cleveland, which makes plumbers' supplies, will build a warehouse at a cost of $25,000.

The people of Irondale, O., are raising funds with which to build a tinplate mill to take the place of the mill dismantled by the American Tin Plate Co.

The McIlroy-Jennings Cornice Works, of Chicago, has been incorporated with $6,000 capital to engage in the manufacture of sheet metal cornices. M. L. Jennings and J. M. McIlroy are the incorporators.

The Clutch Wrench Co., of Milwaukee, Wis., has been incorporated with $6,000 capital to engage in the manufacture of clutch wrenches. F. W. Dent, A. J. Baldwin and C. A. Haertel are the incorporators.

The Helmbacker Forge and Rolling Mill Co., of St. Louis, Mo., has increased its capital from $300,000 to $500,000.

Providing citizens of Springfield, Ill., subscribe $200,000 of the capital stock of the Sattley Malleable Iron Co., of Decatur, Ill., the plant will be removed to Springfield. The company recently increased its capital from $800,000 to $1,000,000.

The Gray Casting Co., of New Castle, Ind., has been organized with $30,000 capital for the purpose of conducting a gray iron foundry. The main foundry building will be 125 feet long and 70 feet wide. The incorporators are W. G. Hillock, J. F. Thompson, I. W. Pitman, G. W. Pitman, Charles Pitman, and E. E. Pitman.

The National Steel & Wire Co., of New Haven, Conn., has absorbed the DeKalb Fence Co. and the Union Fence Co., of DeKalb, Ill. The National Steel & Wire Co. is incorporated under the laws of the State of Maine with $5,000,000 capital.

J. & E. Brown, of Winnepeg, Man., are promoting a company for the purpose of erecting a gray iron foundry. The main building will be 40x120 feet.

The Carolina Bridge & Steel Co., of Burlington, N. C., has been incorporated with $250,000 capital. The incorporators are F. J. Murdoch, E. P. Wharton, and K. W. Curtis.

The United States Marble, Iron & Coal Co., of Denver,

Colo., has been incorporated with $1,000,000 capital. E. J. Wilcox, J. H. Smith, S. E. Phifer, D. Gilbert, G. B. Wilcox, D. W. Barkley and B. G. Barkley are the incorporators.

E. L. Shufford Mfg. Co., Hickory, N. C., will buy a Corliss engine, 25 to 150 horsepower, new or second hand.

Louisiana Car & Equipment Co., Jennings, La., will want iron and wood working equipment.

Kiehl Iron Works, New Orleans, La., is in the market for a punching machine and rolls for sheet iron work.

K. B. Johnson, Willow Springs, N. C., will purchase column power-feed back-geared drill about 20 to 30 inches, planer 30x30 inches and shaper about 16 or 18 inches, new or second hand.

The Standard Tin Plate Co., of Canonsburg, Pa., has been incorporated with $300,000 capital for the purpose of erecting a tin plate plant. S. A. Taylor, S. R. Mason, Jr., and W. I. Berryman, are the directors.

Elkin Veneer & Mfg. Co., Elkin, N. C., will buy wood working machines, shafting, pulleys, hangers, iron pipe and roofing.

The General Automobile & Mfg. Co., of Cleveland, a reorganization of the Hansen Automobile Co., has purchased a plant on Hamilton St. near Marquette and will manufacture gasoline machines.

The West Virginia Malleable Iron Co., of Point Pleasant, W. Va., has been incorporated for manufacturing all kinds of iron castings; authorized capital stock, $100,000; incorporators, R. C. Kyle and E. H. Woelffel, of Columbus, W. Va.; J. S. Spencer, Homer Smith and J. M. H. Beal, of Point Pleasant.

The Blackberry Coal Co., Ashland, Ky., recently incorporated with $1,200 capital, has increased its capitalization to $1,200,000, and proposes developing coal mines and erecting coke ovens. Thomas Boggs, Jr., John F. Hager, and J. W. M. Stewart, of Ashland; Frederick M. Davis, of New York City; Geo. S. Clay, of Plainfield, N. J.; and John W. Rewer, of Scarsdale, N. Y., were the original stockholders.

Fires and Accidents:—

The plant of the West Virginia Boiler & Machine Works, Mannington, W. Va., was destroyed by fire recently; loss, $12,000.

The Tarrant Foundry Co., Chicago, suffered a loss of $76,000 from fire Sept. 13, chiefly in patterns.

Fire damaged the plant of the Kokomo Brass Works, Kokomo, Ind., to the extent of $9,000 last week.

The Mt. Pleasant Foundry & Plow Co., Mt. Pleasant, Mich., suffered a loss of $5,000 on its plant by fire. Insurance about $1,500. The building, owned by Harris Milling Co., was a total loss, with no insurance.

The Pittsburg District:—

Within a few weeks the rebuilt plant of the Firth-Sterling Steel Co., McKeesport, Pa., will be placed in operation in all its departments. For nearly a year the company has been engaged in enlarging the plant in all its departments practically doubling the capacity.

The Pittsburg Tool & Drop Forge Co., Pittsburg, Pa., will be incorporated on September 26, under a Pennsylvania charter. The incorporators are E. L. Maxwell, E. D. Fulton and J. L. McFeeley.

At a meeting of the stockholders of the Clearfield Iron & Steel Co., held last week, the capital stock was increased to $500,000. The company is erecting a plant at Clearfield, Pa., for the manufacture of muck bar, merchant iron and other products.

A special meeting of the stockholders of the Harbison-Walker Refractories Co., of Pittsburg, will be held shortly for the purpose of increasing the capital from $25,350,000 to $27,600,000.

New Construction:

The Girard Boiler & Mfg. Co., Girard, O., has been awarded the contract by the West St. Louis Construction Co., St. Louis, Mo., for the erection at Kirkwood, Mo., of a steel standpipe 24 feet diameter and 110 feet high.

The John A. Roebling's Sons Co. is making some improvements to its plant in Trenton, N. J., consisting of three buildings, a leaded-cable shop 324x105 feet, one story high, and two insulated wire buildings at right angles to the cable shop. Of the latter, one will measure 360x66 feet, and the other 490x66 feet. Both will be four stories high. The foundations for these structures are now being built. Work on a power plant of 1,200 horsepower has also been begun.

The Bourne-Fuller Co., of Cleveland, has just let contracts for a building, 30x120 feet, to be erected adjoining its present warehouse. The new structure is to hold the company's stock of pipe, of which it carries a large quantity for steam, gas and water purposes.

The new foundry of the Novelty Iron Co., Canton, O., will be in full operation in less than a week. The equipment includes a 10-ton electric crane.

The additions to the plant of the Aultman Co., Canton, O., are under roof. They include large additions to the boiler, blacksmith, ice machine and paint departments, and will greatly facilitate the handling of material at the plant. A recent shipment of an engine and thresher was made to Pretoria, South Africa.

The Keystone Mfg. Co., of Buffalo, N. Y., manufacturers of machine tools, will erect a new building for the location of their plant. The new building will be 80x100 feet. Considerable new machinery will be added to the present equipment which will be removed to the new plant.

The Grand Rapids Edge Tool Works, Grand Rapids, Mich., will erect a new plant 60x100 feet.

The plant of the Clark Engine and Boiler Works, Kalamazoo, Mich., which was recently destroyed by fire will be entirely rebuilt. The machine shop will be 50x100 feet and the boiler shop 50x140 feet.

The Eynon Evans Mfg. Co., Philadelphia, Pa., will erect an addition to its foundry 20x140 feet.

The Detroit Copper & Brass Rolling Mill Co., Detroit, Mich., will erect an additional brass foundry.

The Donovan Wire & Iron Co., Toledo, O., will erect a machine shop 60x200 feet, foundry 60x180 feet and pattern shop 40x80 feet.

The Wilson Steam Boiler Co., Omaha, Neb., is erecting a new brick building, 50 feet front by 125 in depth, with truss roof, and expects to equip it with the latest improved machinery and tools. The business of this company has grown rapidly of late.

Work on the new Brown-Corliss Engine Co.'s molding shop at Corliss, Wis., has been commenced. The building will be 190x115 feet and constructed of steel and brick.

The plant of the American Foundry & Machine Co. at Ravenna, O., recently completed, is in active operation with 75 employes and as many more will soon be on the pay roll.

The Reynolds-Chalou Foundry Co., Troy, N. Y., has leased the Empire foundry property in the same city. The Empire plant was considerably damaged by fire last winter and it will now be repaired and improved.

The Toledo plant of the American Bridge Building Co. has started to enlarge its electric crane carriers. The company will build a 50-foot extension on the west end of the front crane, and also a 30-foot extension of the east end. The rear traveling crane will be lengthened about 30 feet.

Plans have been completed for the Metaine Ridge, La., car shops of the New Orleans Railways Co. All cars needed by the company will be turned out at these shops.

Ground has been broken for the erection of the new building of the American Locomotive Co. at Schenectady, N. Y. The structure will be 400x175 feet, of steel and masonry. The contract for the steel structural work has been awarded to the Phoenix Iron Works, Philadelphia.

The American Blower Co., Detroit, is building a brick machine shop, 50x60 feet, and adding a third story to a part of the old plant. The additions will cost about $6,000.

The Peru Steel Casting Co., Peru, Ind., will build an addition of 64 feet to the casting house.

The Lamb Mfg. Co., of South Sioux City, Ia., has increased its capital stock from $50,000 to $150,000, and on Sept. 20 will begin the erection of an addition to its plant to be used for the manufacture of malleable iron castings. At present the plant is manufacturing novelties, and about 40 men are employed. The enlarged plant will give employment to 150 men from the start.

A machine shop, 200x50 feet, is to be erected at Lansing, Mich., by Bates & Edmonds.

The Rimmon Mfg. Co., Seymour, Conn., will erect a three

story addition, 38x60 feet. They manufacture brass and other metal goods.

The Wilks Foundry Co., Toledo, which was organized only last February, began building in March and took the first heat May 22, will build an addition 100x65 feet to the present building. This addition has been made necessary by the rapid increase of business of the new concern. The company is now making ten 20-ton engine bed plates for the Allis-Chalmers Co., West Allis, Wis.

The Mix & Riddell Hardware Mfg. Co., Stamford, Conn., will erect a four story main building, 210x40 feet, and a brass foundry and power house, 40x70 feet.

General Industrial Notes:—

At the annual meeting of the stockholders of the Hartford Foundry Corporation, Hartford, Conn., held recently, directors were elected as follows: Albert Horton, James B. Moore, Theodore M. Lincoln, J. W. Conway, E. H. Cady, and J. G. Buckley. The directors elected the following officers: T. M. Lincoln, president; J. W. Conway, vice president; E. H. Cady, secretary and treasurer, and J. G. Buckley, assistant secretary.

The new foundry of the Olds Motor Works, Lansing, Mich., in nearly completed and the first cast will be made shortly.

A. M. Danbury and J. J. Foley, of Cincinnati, O., have purchased a two-thirds interest in the Ball-Mitchell Foundry at Maysville, Ky. The plant is to be considerably enlarged and additional molders will be employed.

The following large consolidations have made application during the past few days to be listed on the New York Stock Exchange: American Steel Foundries, capital $40,000,000, of which $15,000,000 preferred and $15,500,000 common will be issued; United States Shipbuilding Co., capital $45,000,000; International Nickel Co., capital $24,000,000.

Work on the new furnace of the Consolidated Coal & Iron Co., Gadsden, Ala., is progressing rapidly and it is probable that operations will be commenced shortly before the first of the year. The furnace is to have a daily output of 250 tons. Fifty new coke ovens have just been completed and fifty additional ovens are to be built immediately.

The cold blast furnace located at Round Mountain, in Cherokee County, Ala., has been purchased by the W. J. M. Gordon Chemical Co., and will be blown in immediately. W. A. Cobb has been appointed manager of the plant and a large force of men are at present engaged in making repairs on the plant. The output of the furnace will consist of cold blast charcoal iron and wood alcohol will also be manufactured.

The molders employed in the foundries of Los Angeles, Cal., have gone on a strike to enforce a demand of $3.50 per day of nine hours, time and a half for overtime and double time for Sundays and holidays. The following plants have been affected: Llewellyn Iron Works, Keystone Iron Works, Partridge & Alford, Pacific Coast Foundry, Union Iron Works, Fulton Engine Works, Washington Iron Works, Storm Brass Co., Axleton Iron Works, Baker Iron Works, Western Iron Works and Jones' Brass Works.

The buildings for the new plant of the Marietta Sheet & Tin Plate Co., Marietta, O., have been completed and the work of erecting the mills has been commenced. It will be several months before the plant can be placed in complete operation.

At a meeting of the stockholders of the Cambridge Rolling Mill Co., Cambridge, O., held last week, directors were elected as follows: T. W. Scott, H. P. Woodworth, Alex Robins, L. R. Davidson, and C. S. Sheppard. Officers were elected as follows: T. W. Scott, president; Alex Robins, vice president; H. P. Woodworth, secretary, and C. S. Sheppard, treasurer.

Extensive improvements are being made at No. 3 puddle mill of the American Steel Hoop Co., Youngstown, O. The single furnaces are being torn down two at a time and double furnaces with Cahall boilers attached are being erected in their stead.

The equipment of machine tools of the Columbia Iron Works, St. Clair, Mich., is complete and includes the latest improvements. Among the manufacturers from whom purchases were made are the following: Hilles & Jones Co., Wilmington, Del.; Cleveland Punch & Shear Works, Cleveland; Reade Machinery Co., Cleveland; Acme Machinery Co., Cleveland; Betts Machine Co., Wilmington, Del.; Detrick & Harvey Co., Baltimore, Md.; Davis Machine Co., Rochester, N. Y.; Bickford Drill Co., Cincinnati, O.; Buffalo Forge Co., Buffalo, N. Y.

The Buckeye Engine Co., of Salem, O., recently secured an engine contract from Kyoto, Japan.

The Baldwin Locomotive Works, of Philadelphia, have secured a contract calling for the shipment of four locomotives for the Central Railroad of Brazil.

The St. Louis Machinists' Supply Co., which makes a specialty of machinists' tools and supplies, has already built up to good proportions the business established at the beginning of the year. A catalogue illustrating the company's products is sent on application. The company is located at 421-423 Franklin Ave., St. Louis. H. Rubelmanne is president.

The Riverside Foundry Co., of Cleveland, made a shipment of three carloads of heavy castings to Mexico this week.

The wire-drawing department of the Hartman works, New Castle, Pa., of the Cuyahoga Wire & Fence Co., Cuyahoga Falls, O., is expected to be in operation by Oct. 1.

Geo. D. Walcott & Son, Jackson, Mich., have just received an order from the British government for a shaper to be used on one of the English war vessels.

The John Hutchison Mfg. Co., Jackson, Mich., reports that the demand for its new roller bearing box has been beyond expectations.

Geo. A. McKeel & Co., Jackson, Mich., manufacturers of ferrules and sheet metal goods, who recently doubled their capacity, are crowded to their utmost.

The Akron Mfg. Co., recently incorporated under the laws of Delaware, is a reorganization of the Akron Mfg. Co., of Akron, O., which existed under Ohio laws. The new corporation will carry on the business as heretofore conducted, but the capital stock has been increased from $10,000 to $30,000.

The Saxton Furnace Co., of Philadelphia, has purchased the Valley Iron Works, near Coatesville, Pa., formerly owned by W. W. Kurtz & Son. The Saxton company operates furnaces at Saxton, Pa.

The Enterprise Machine Works, recently organized at Durand, Mich., will build and repair machinery and develop inventors' ideas.

The Zanesville Malleable Iron Co., Zanesville, O., will soon have its new plant in operation. It will make malleable castings and about 120 men will be employed.

The Niles-Bement-Pond Co. has secured a contract from the Grand Trunk Railway Co., of Canada for some $20,000 of heavy machine tools.

The J. G. Brill Co., of Philadelphia, has secured a contract for car trucks for the Bendigo, Victoria, Australia, electric traction system.

New and improved machinery will be added to the plant of the Milwaukee Harvester Co., now the Milwaukee division of the International Harvester Co., the output for the coming year will be increased 50 per cent, and the force employed will be enlarged in about the same proportion. This will increase the number of employes to over 1,000.

The H. N. Strait Engine Co., Kansas City, Mo., in now operating its new plant. The foundry is 150x50 feet. The machine shop is equipped with cranes and other modern machinery.

The Gadsden Car, Foundry & Machine Co., Gadsden, Ala., has purchased the Proctor Foundry & Machine Works, of the same city, and consolidated the two. A large amount of new machinery will be installed. The company will make a specialty of building tram, logging and crane cars and heavy castings.

The firm of Ellis W. Morse & Co. has begun business at Binghamton, N. Y., opening a jobbing store for mill and steam supplies, engines and boilers. There is no other jobbing house nearer than Syracuse.

The Buckeye Engine Co., Salem, O., expects to put in two large electric cranes at an early date.

The Bessemer Coke Co., of Pittsburg, manufacturer of Connellsville coke, has increased its output by recent additions of ovens and now produces 100 cars a day.

The Consolidated Lake Superior Co. (Clergue Syndicate) is reported by one of its officers to be making a daily output of 280 tons of rails at the plant of the Algona Steel Co. at Sault Ste. Marie, Ont. When the plant is completed it is stated that 550 tons a day will be turned out, the converter capacity at its best being 1,000 tons a day. The steel plant and blast furnaces, it is stated, will represent ultimately an outlay of $5,000,000. The ore shipments from Michipicoten Bay to June 30 this year were 210,000 tons, against 169,000 tons to the corresponding date last year. Latterly owing to a change in the system of mining at the Helen mine there has been a partial suspension of shipments.

SPECIFICATIONS FOR FOUNDRY SUPPLIES.

(Continued from page 34.)

Spiegel Iron is used mostly in steel making. It is supposed to contain from 10 to 25 percent of manganese, but some authorities place the range from 3.50 to 20 percent.

Ferro-Manganese contains from 25 to 90 percent of manganese. Most of the ferro-manganese on the market runs about 80 percent of manganese. With 80 percent of manganese present, there is not much room for iron. The metal, however, usually contains sulphur, phosphorus, carbon and silicon.

In cupola practice the amount of ferro-manganese used is generally very small, consequently the effect of the other metalloids is not great.

Manganese has a tendency to keep the carbon in the combined form; hence it lowers the graphitic carbon, thereby reducing the deflection. It neutralizes the effect of sulphur by reducing "red-shortness," and indirectly offsets the "cold-shortness" or brittleness caused by high phosphorus.

In foundry practice, the more manganese present in the pig, the more silicon and graphitic carbon required to produce soft castings.

For "chill mixtures," where great toughness is required, a pig with 2 percent manganese and less than 1 percent silicon is a desideratum.

No. 273—Malleable Bessemer Pig.

This specification will cover both the "common" and "straight" malleable Bessemer. When the "straight" Bessemer pig is specified, it is understood that the phosphorus is not to exceed 0.10 percent. Straight Bessemer with 1.00 to 1.50 percent of silicon, about 0.60 percent manganese, under 0.11 percent phosphorus, and below 0.04 percent sulphur, will be satisfactory.

In "common" Bessemer the following limit will be specified:

Silicon, may range from	0.70 to 2.10%
(Silicon of .....% preferred.)	
Sulphur, must not exceed	.045%
Phosphorus, must not exceed	.15%
Manganese, may range from	0.30 to 1.20%
(Manganese of .....% preferred.)	
Total carbon, should not exceed	3.75%

As a rule the combined carbon will vary from 0.30 to 1.30 percent, and the graphitic carbon from 3.45 to 1.80 percent.

(Preferred figures will be marked in red ink, and when specified, we expect to get an iron not varying more than 0.10 percent either way. When no preferred figure is specified, the silicon and manganese may be anywhere within the above limits.)

The iron will be rejected if the analysis shows more than 0.05 percent of sulphur, or more than 0.18 percent of phosphorus.

No. 274—Charcoal Irons.

Charcoal iron differs from coke iron mainly in regard to the carbon.

The graphitic carbon appears to be in a finer state of division, and when changed into the combined form it produces a closer grain and stronger metal than does a coke iron with the same amount of total carbon. It is especially adapted to "chill work," and by regulating the amount of silicon and carbon, it is possible to get any desired chill.

The sulphur, phosphorus and manganese are quite constant in charcoal iron; the silicon and carbon vary to a decided degree, and these two elements will govern the various grades.

Graded according to fracture, there are usually seven distinct grades, designated by letters and numbers, and in some cases branded as "soft," "foundry," "medium," "high," "low," etc. (high and low referring to carbon).

Charcoal iron ranges in silicon from 0.30 to 3.00 percent. The total carbon will run from 2.50 to 4.50 percent, in some cases even higher.

In this specification we shall not specify any grade or number, but will ask for "preferred" percents as follows:

Silicon, general total range	0.30 to 2.75%
(Silicon of .....% preferred.)	
Sulphur, must not exceed	.025%
Phosphorus, must not exceed	.25%
Manganese, should not exceed	.70%
Total carbon, general range	2.50 to 4.50%
(Carbon of about .....% desired.)	
(Preferred figures to be marked in red ink.)	

"Low" carbon will be understood to closely approximate 2.50 percent, "medium" carbon as 3.50 percent, and "high" carbon as 4.50 percent, or above.

NOTE.—Charcoal iron gives a "chill" in accordance with the amount of silicon present, the other constituents remaining constant, or nearly so.

The following table is approximate, but near enough to give some idea of the effect of silicon on the carbon:

0.30%	silicon equivalent to	1½-in. chill.
.40%		1-in. "
.52%		⅝-in. "
.70%		¼-in. "
1.00%		⅛-in. "

Above 1.00 percent a chill may be induced by increasing the sulphur, or by altering the amount of manganese and carbon.

With manganese at 0.50 percent and sulphur at 0.095 percent in a mixture, the castings will take on a decided chill even with medium high silicon.

Sulphur increases, silicon diminishes, managanese toughens or stiffens, and phosphorus remains neutral in regard to chill.

A high carbon will give a hard, shallow chill, while a low carbon gives a soft, but deeper chill.

Chill is governed to a great extent by the cooling of the molten iron, different results being obtained by pouring against a large or small surface chill plate; also in pouring horizontally or vertically against the chill. A reverberatory furnace gives better results than a cupola in chilled work, due to the different effect on silicon.

No. 275—Phosphorus Pig Iron.

Phosphoric iron is used almost exclusively for small thin castings, where great "fluidity" is desired.

A very fluid iron is essential in thin work as it fills every part of the mold and gives a clear solid casting.

Iron high in phosphorus is very weak and brittle under impact (shock), consequently it cannot be used where great strength is required. With high silicon and a high graphitic carbon, the phosphorus may rise to 1.00 percent in the casting, but in chilled work with low silicon and much combined carbon, the phosphorus must be kept below 0.30 percent.

This specification calls for an iron within the following limits, viz.:

Silicon, must not be less than	1.50%
(A higher silicon preferred.)	
Sulphur, must not exceed	.055%
Phosphorus, should not be below	1.00%
Manganese, may range from	0.30 to 0.90%
Total carbon, should not be below	3.00%

Any car of iron showing on analysis more than 0.06 percent sulphur, or less than 0.90 percent of phosphorus, will be rejected.

REMARKS.—These specifications will be submitted whenever a purchase of pig iron is to be made, with the distinct understanding that there is to be no deviation from the figures specified.

The amount of each grade required, and the terms of contract are to be filled out in the form printed with the specifications.

Special Contract.

(Pig Iron.)

NOTE.—In our specifications for pig iron the words *"must not"* are to be considered as an arbitrary term and admit of no radical change from the specified figure.

The term *"should not"* is intended as a suggestion in regard to what we desire, but is not strictly an absolute factor.

In the event of the party selling pig iron not being able to meet the requirements of the regular specifications, it is proposed that such "off grade" iron be purchased under ***special contract,*** such contract plainly stating the minimum or maximum limit of silicon, sulphur, etc.

The party selling the iron is to fill in the blanks below with the minimum or maximum amount of the metalloids, and if satisfactory to the purchasing agent both parties are to sign a special contract.

SPECIAL PIG IRON.

Brand	
Silicon, not less than	.....%
Sulphur, not over	.....%
Phosphorus, not over	.....%
Manganese, between ..... and	.....%

No. 258—Specifications for Foundry Coke.

Under this specification we desire a good, clean, 72-hour coke; as free as possible from coke dust and cinder.

The percentage of wall coke, known as "black heads" must not be greater than that usually found in "Selected" No. 1 foundry coke.

The coke should be of the massive form, and reasonably free from small particles, i. e., granulated coke.

"Structure" is an important feature and will be considered when purchasing coke.

The structure of a perfect 72-hour coke should, according to theory, be made up as follows:

Cellular structure	56%
Coke structure	44%

We do not expect to get a coke with an ideal structure, but we do insist on a coke with a proper structure for cupola work.

Our castings are made according to specifications; and, as the iron is mixed by analysis, it is absolutely necessary that the coke be low in sulphur and phosphorus.

Well-washed coke should not exceed the amount of sulphur herein specified.

When a car of coke is received it will immediately be sampled by an experienced man, who will select two average samples (ten pieces) of the coke from different parts of the car, and these two samples will be sent to the laboratory for a check analysis.

The coke will be accepted if it comes within the following limits, viz.:

Moisture, should not exceed	1.50%
Volatile matter, should not exceed	3.50%
Fixed carbon, must be above	86.00%
Sulphur, must not exceed	.75%
Ash, may range from	5.50 to 11.50%

Coke will be rejected which shows on analysis:

More than 0.85% of sulphur;
More than 0.05% of phosphorus;
Less than 85% of fixed carbon;
Less than 5% of ash.

These limits will be strictly adhered to and no concessions made in any case.

NOTE.—The Heinrich method is used for all determinations in the proximate analysis of coke, except sulphur, which is determined by Eschka's method.

When sulphur is included in an anlysis, it is to be understood that the volatile matter carries one-half, and the fixed carbon the other half of the percentage due to this element.

The two following analyses of a "light" and a "strong" coke will give a good idea of our method and statement of a coke analysis.

Both of these cokes are within the limits of the specifications; No. 1 is a "light" coke, and No. 2 is a "strong" heavy coke.

	No. 1.	No. 2.
Moisture	0.33%	0.49%
Volatile matter	2.25%	1.31%
Fixe carbon	90.54%	87.46%
Sulphur	.60%	.72%
Ash	6.28%	10.02%
Structure, cells	52.94%	50.04%
Structure, coke	47.06%	49.96%
Specific gravity	1.697%	1.89%
Heat units (per lb.)	13,540.0	12,937.0

No. 1 is a light coke with medium porosity, and will give a quick intense heat.

No. 2 is a strong coke, and will hold up a heavier burden of iron; the porosity is lower (i. e., the coke is more dense), consequently a stronger blast is required.

A strong, heavy coke will give a steady continued heat.

No. 276—Specifications for Machinery Scrap.

Under this specification we desire a good clean scrap iron, such as agricultural implements and light machinery scrap.

The scrap must contain no wrought iron, steel, stove plate, grate bars, car wheels, brake shoes, chilled roll, etc.

Malleable scrap is objectionable, also excess of oxide or rust.

Large pieces, weighing more than 400 pounds, will not be accepted.

When a car of scrap is received, the inspector will superintend the unloading, and discard the following objectionable scrap, viz.:

Wrought iron, steel, burnt stove plate, grate bars, car wheels, brakeshoes, large chilled work, burnt malleables, and large pieces weighing more than 400 pounds.

Rejected scrap will be deducted from the total weight of scrap received, and payment made only on accepted material.

No. 298—Specifications for Molding Sand.

Sand purchased under this specification must be reasonably free from stones, dirt, silt, and organic matter, such as roots, decomposed vegetation, etc.

Three kinds of sand will be considered, viz.: Silica or fire sand; molding sand and core sand. These sands will be classified according to their chemical composition, and graded, according to the degree of fineness, into five distinct grades or numbers as follows:

Grade.	Deg. of fineness.
No. 1. Superfine	Above 100%
No. 2. Fine or light	100 to 90%
No. 3. Medium	90 to 75%
No. 4. Coarse or heavy	75 to 55%
No. 5. Extra coarse	55 to 30%

In specifying the fineness of sand, the above numbers will be used, and will apply to silica, molding, and core sand.

No sand will be accepted which varies more than 5 percent from the grade designated at the time of purchase.

Silica or Fire Sand.—This material is used for refractory work, tempering high bond molding sand, mixing with fire clay, for steel casting purposes, and for grinding.

Good fire sand will usually run about 98 percent of silica, with very little alumina, lime, magnesia, or combined water, and not more than a mere trace of iron.

No fire sand will be accepted which shows, on analysis, less than 95 percent of silica, more than 4 percent of alumina, or more than 1 percent of lime.

The following analysis of an average fire sand will give some idea as to what is desired:

Silica (SiO^2)	98.04%
Alumina (Al^2O^3)	1.40%
Iron (Fe^2O^3)	.06%
Lime (CaO)	.20%
Magnesia (MgO)	.16%
Combined water (H^2O)	.14%
Specific gravity	2.592

Molding Sand.—Molding sand for iron work generally contains from 75 to 85 percent of silica, 5 to 13 percent of alumina, usually less than 2.5 percent of lime and magnesia, not over 0.75 percent of fixed alkali (soda and potash), generally less than 5 percent of iron, and seldom more than 4 percent of combined water.

Sand for brass molding may contain a much higher percentage of iron and lime, without doing any particular harm.

All molding sands usually contain some organic matter, generally present in the form of small roots or as decomposed vegetable matter.

We do not expect to buy sand with an exact chemical composition, as this is almost an impossibility, the same bed of sand often varying several percent in silica and alumina at different places; we do, however, reserve the right to reject any sand not of the required degree of fineness, or that contains an excessive amount of carbonate of lime, magnesia, iron and organic matter. Our limit for the objectionable elements is as follows:

Carbonate of lime must not exceed 1.50 percent in an iron molding sand, and should not exceed 2.25 percent in a brass sand;

Iron must not exceed 5.50 percent in the iron molding sand, or 7 percent in a brass sand;

Organic matter must not exceed 1 percent, and preference will be given sand running lower in organic matter.

Clay and silt are objectionable, consequently any sand showing on analysis more than 13 percent of alumina will be rejected. (See note.)

The following analyses of molding sand will give some idea as to their chemical composition:

	Kind of work			
	Iron.			Brass.
	Light	Medium.	Heavy.	Light.
Silica (SiO^2)	82.21	85.85	88.40	78.86
Alumina (Al^2O^3)	9.48	8.27	6.30	7.89
Iron oxide (Fe^2O^3)	4.25	2.32	2.00	5.45
Lime oxide (CaO)	....	.50	.78	.50
Lime carbonate ($CaCO^3$)	.68	.29	...	1.46
Magnesia (MgO)	.32	.81	.50	1.18
Soda (Na^2O)	.09	.10	...	.13
Potash (K^2O)	.05	.03	...	.09
Manganese (MnO)	...	Trace.	.25	Trace.
Combined water (H^2O)	2.64	1.68	1.73	3.80
Organic matter	.28	.15	.04	.64
Specific gravity	2.652	2.645	2.630	2.640
Degree of fineness	85.18	66.01	46.86	94.88

So far as the chemical composition is concerned, any one of the above sands would answer fairly well for nearly any class of work, but it is absolutely necessary that the proper degree of fineness be carefully considered.

Core Sand.—The quality, or chemical composition of a core sand, according to some authorities is of minor importance, the degree of fineness being the main feature. As a rule, a good core sand should be high in silica and low in alumina. The bond for core sand is obtained by adding rosin, flour,

etc., consequently the desired effect is produced with a high silica sand, or with a sand low in alumina and iron. A sand low in alumina and iron will permit of the rapid escape of the gases, whereas a high alumina or a clay sand bakes and holds back the gases.

The two following analyses, although radically different, are good core sands, due entirely to low alumina and iron:

	Core sand—Extra quality.	Core sand—Fair quality.
Silica (SiO^2)	94.30	69.31
Alumina (Al^2O^3)	1.95	4.76
Iron oxide (Fe^2O^3)	.33	1.58
Lime carbonate ($CaCO^3$)	1.63	3.50
Lime sulphate ($CaSO^4$)	....	8.19
Magnesia (MgO)	.54	7.77
Alkalies (Na^2O, K^2O)	.05	.12
Combined water (H^2O)	1.05	2.95
Organic matter	.15	1.82

Objection will be made to core sand containing more than 5 percent of alumina, or more than 2.5 percent of iron.

When a shipment of sand is received, the inspector will select three samples of about 2 pounds each, from different parts of the car, and these samples will be sent to the laboratory for examination. The sand after being thoroughly mixed by machinery, will first be weighed, then dried at a temperature of 220 degree F., for 1 hour, or until perfectly free from moisture; the difference or loss in weight, of the moist sand and the dry sample will represent the amount of moisture present. The degree of fineness and the chemical analysis are to be determined by the dry sample.

The apparatus required for estimating the percentage or degree of fineness, consists of a scale or balance sensitive to 1 cm. or a tenth of a grain, and a set of 5-inch U. S. standard brass sieves of the following mesh, viz.: 100, 80, 60, 40 and 20. These sieves are fitted with a cover and a bottom pan, and may be used separately or in combination; they may be obtained of any dealer in chemical apparatus.

METHOD OF DETERMINING THE DEGREE OF FINENESS OF SAND.

Exactly, 100 grams (or, if preferred, 1,000 grains) is carefully weighed out and emptied into the 100 mesh sieve, which has been previously placed upon the bottom pan.

The sieve is now shaken for exactly 1 minute, mostly sidewise, but occasionally up and down to free the meshes of sand; at the end of 1 minute the bottom pan is removed, the sand weighed that has passed through, and the weight credited to the 100 mesh sieve.

The sand remaining on the 100 mesh sieve is then emptied into the 80 mesh sieve placed upon the bottom pan as before and the sieve just used is thoroughly cleaned with a stiff stencil brush.

The 80 mesh sieve is shaken as before for exactly 1 minute and the sand which has passed through is carefully weighed and credited to the 80 mesh grade. In similar manner 60, 40 and 20 mesh sieves are used each receiving credit respectively.

The amount of sand passing through the sieve, multiplied by the number of the mesh, and the sum of the several results divided by 100, will give the average percent or degree of fineness of the sample.

Usually there is a small loss, due to dust and to small particles of sand remaining in the meshes.

Using a set of sieves as described above, the average mesh of the series will be 60, consequently any loss sustained should be multiplied by this figure and added to the total amount.

In case there should be some coarse material remaining on the 20 mesh sieve it is weighed and credited to a No. 1 mesh.

The following example will more clearly illustrate the method and calculations:

Weight, sand passing through.			No. or mesh of sieve.			Total.
55.22	grams,	×	100	mesh	=	5,522.00
20.89	"	×	80	"	=	1,671.20
11.64	"	×	60	"	=	698.40
10.57	"	×	40	"	=	422.80
1.20	"	×	20	"	=	24.00
.06	"	×	1	"	=	.06
99.58						
.42	(loss)	×	60	"	=	25.20
						8,363.66

8,363.66 ÷ 100 = 83.64%

which is assumed to be the correct degree of fineness.

In case of dispute it is customary to make duplicate determinations of the degree of fineness, and take the average as an absolute figure.

If the test is carefully carried out there should be very little loss, and duplicate determinations should not vary more than 2 percent.

NOTES ON SAND.

The following remarks on the effect of certain elements in sand will give some idea as to what is desired, and to what is considered objectionable.

Silica is the fire-resisting element; it has no bond, i. e., binding property, consequently in a sand where adhesiveness is required, alumina must be present; silica alone is very refractory, but, in the presence of the fluxing elements, iron, lime, magnesia, soda and potash, it readily fuses and forms silicates; these silicates fuse or melt at about the following temperatures:

Silicate of	alumina	melts at	4,350° F.
" "	magnesia	" "	3,960° F.
" "	lime	" "	3,810° F.
" "	iron	" "	3,270° F.
" "	soda	" "	1,500° F.

When soda or potash is present, silicates are formed at low temperatures.

Iron melts at 2,200 to 2,300 degrees F., consequently a sand containing much iron, lime and alkali, will burn or fuse into the molten metal, when molding, or in other words, the more lime or alkali present the more easily the sand is converted into a slag.

Alumina is the binder, hence a sand high in alumina is said to be strong or possess "bond;" alumira is very refractory, but unlike silica, it "bakes together" like pottery at a high temperature, consequently too much alumina must not be present in sand, otherwise the mold would be spoiled by excessive shrinkage or by the sand being non-porous.

Lime may exist in sand as oxide, hydrate, carbonate or as sulphate, occasionally in two different forms, but usually as carbonate and oxide; the carbonate is the most objectionable form, as on heating, the carbonic acid gas is driven off, producing an excess of gas and reducing the original volume of sand.

Most of the lime salts are converted into oxide on burning, consequenetly excess of lime will cause a mold to either drop or crumble.

Iron may be present as ferrous oxide, ferric oxide, hydroxide, or as ferrous carbonate, all of which are converted into ferric oxide by heat. Iron in the presence of silica, alumina, lime, magnesia, etc., has a tendency to fuse or produce a slag by reduction.

Manganese in sand acts in a similar manner to iron, but not in such an energetic manner on account of its high fusion point.

Magnesia is very similar to lime, but less harmful on account of being more refractory.

Organic matter gives bond to sand, but the bond or binding property is destroyed the moment it comes in contact with the molten metal, the organic matter being burned out; consequently, there is a loss in volume and this shrinkage causes the sand to fall or crumble.

Combined water is always present in high alumina sands, and is one reason for the shrinkage in a strong bonded sand.

The sand purchased under this specification must be within the specified limits in regard to iron, lime, and organic matter.

In buying sand, particular attention will be paid to the degree of fineness; the sand will be designated by number and must correspond to the proper degree of fineness; thus, for example, if a No. 3 molding sand is ordered, the degree of fineness must be between 75 and 90 percent.

The grade and number will be specified by the purchasing agent as follows:

Grade..... No.....
" ..... "
" ..... "
.....Purchasing Agent.

Specifications for Foundry Castings.

NO. 1. SPECIAL HARD IRON. (CLOSE GRAINED.)

Designed for air and ammonia compressors, high-pressure engine cylinders, valves, etc.

A. Chemical Composition.

Silicon must be between 1.20 and 1.60 percent. (Below 1.20

the metal will be too hard to machine; above 1.60 it is liable to be porous unless much scrap be used.)

Sulphur must not exceed 0.095 percent, and any casting showing on analysis 0.115 percent, or more of sulphur will be the cause for rejectment of the entire mix. (Above 0.115 percent, sulphur produces high shrinkage, shortness, and "brittle hard" iron.)

Phosphorus should be kept below 0.70 percent, unless specified for special thin castings. (High phosphorus gives brittle castings, under impact.)

Manganese should not be above 0.70 percent, except in special chilled work.

B. Physical Requirements.

Transverse breaking strain, with load applied at the center and supports 12 inches apart, on a square test bar 1 inch square and 13⅓ inches long, must stand a stress of not less than 2,400 pounds. All bars to be micrometered and figured to an exact square inch.

Deflection should not be less than 0.08-inch, when taken with a standard deflectometer.

Shrinkage, measured on a 13.333-inch bar cast in a yoke, giving chilled ends, must not exceed 0.161-inch, after deducting one-tenth, so as to compute the shrinkage in 12 inches.

Chill, measured on the end of a test bar cast in a yoke, should not be more than 0.25-inch, except in chilled work where certain depth is required.

Tensile strength of an extra test bar cast in sand, without the yoke, must not be less than 22,000 pounds.

The casting must be free from blow-holes, slag, dirt, shot, cinder, kish and cold shuts.

A clean, close grained and strong iron is required for this class of work.

The mixture for this iron may be made from charcoal iron, low silicon foundry, home scrap, and steel scrap not to exceed 25 percent, or wrought scrap not to exceed 10 percent.

Enough scrap should be used so as to keep the graphitic carbon down low enough to produce a close grained iron.

Extra strength and greater chill may be obtained by adding from 1 to 10 pounds of 80 percent ferro-manganese to every 1,000 pounds of the charge, but should not be added unless specified.

NO. 2. MEDIUM IRON.

For engine cylinders, gears, pinions, etc.

A. Chemical Composition.

Silicon to be between 1.40 and 2 percent. (Silicon at 1.50 percent gives the best wearing result for gears.)

Sulphur must not exceed 0.085 percent, and any casting showing on analysis 0.095 percent or more of sulphur will be the cause for rejectment of the entire mix. (Sulphur preferred at 0.075 to 0.080 percent.)

Phosphorus should be kept below 0.70 percent, except in special work.

Manganese should be below 0.70 percent unless otherwise specified.

B. Physical Requirements.

Transverse breaking strain, as described under No. 1 iron, must not be less than 2,200 pounds.

Deflection not less than 0.09-inch.

Shrinkage on test bar cast in yoke must not exceed 0.151-inch.

Chill should be below 0.15-inch.

Tensile strength of a test bar cast in sand must be above 20,000 pounds.

The iron must be free from blow holes, shrink cavities, slag, kish, shot, cold shuts, blisters, etc.

This mixture may be made with Nos. 1, 2 and 3 foundry pig, home and foreign scrap. Total scrap should not be over 50 percent. For safety, in a 50 percent mix the foreign scrap should be figured at 0.100 percent for sulphur.

NO. 3. SOFT IRON.

For pulleys, small castings, and general agricultural implement work.

A. Chemical Composition.

Silicon must not be less than 2.20 or more than 2.80 percent, with a preference for about 2.40 percent. (Below 2.20 percent small castings will be very hard; above 2.80 percent large castings will be somewhat weak and have an open grain.)

Sulphur in no case must exceed 0.085 percent. (If above 0.095 percent the whole lot will be condemned.) High sulphur makes iron "brittle short," and causes excessive shrinkage.

For frictional wear in brakeshoes, etc., the sulphur may run up to 0.150 percent.

Phosphorus should be kept below 0.70 percent, except in cases where great fluidity is required, as in thin stove plate, when it may run up to 1.25 percent. (Phosphorus makes iron brittle under impact.)

Manganese should be kept below 0.70 percent, except in chilled work. (Manganese toughens iron, produces chill, and causes excessive shrinkage.) For a heavy chill the manganese may vary from 0.70 to 1.25 percent.

B. Physical Requirements.

Transverse breaking strain must not be under 2,000 pounds.

Deflection should not be under 0.10-inch.

Shrinkage must in no case be above 0.141-inch when figured to a 12-inch bar, this being equvalent to one-eighth of an inch to the foot on castings molded in sand.

Chill should be under 0.05-inch.

Tensile strength on a sand cast bar must not be below 18,000 pounds.

The iron must be free from defects, such as blow holes, shot, blister, cold shuts, slag, shrink cavities, kish, contraction cracks, etc.

Misplaced cores, poor molding and insufficient cleaning will also be cause for rejectment.

This mixture may be made from Nos. 1 and 2 foundry pig, home and foreign scrap.

Scrap should be used in sufficient quantity to prevent formation of "kish" and to obtain the desired strength. It should run from 30 to 50 percent, being governed by the sulphur. Equal parts, or 15 percent home with 30 percent foreign scrap is a good proportion to use. Scrap or remelted iron gives strength to castings by reducing the graphitic carbon and closing the grain.

In mixing by analysis it is better to figure foreign scrap at 0.100 percent sulphur.

When the sulphur in the castings rises above 0.081 percent the percentage of scrap should be reduced in the next mix in order to regulate the sulphur. With low sulphur (0.071 percent about) 50 percent of scrap may be used.

The navy department has awarded contracts for the supply of steel material to be used in the construction of the new battleship Connecticut at the New York Navy Yard, as follows: Class 1, ship plates, The Carnegie Steel Co., $179,007; class 2, nickel steel plates, Carnegie Steel Co., $158,077; class 3, steel shapes, Carnegie Steel Co., $78,489; class 4, steel castings, United States Steel Co., $27,763; class 5, hull rivets (plain), American Iron & Steel Mfg. Co., $19,353.

At a recent meeting of the directors of the Dominion Iron & Steel Co., at Montreal, arrangements were completed for taking over the property of the Dominion Coal Co., on the basis of 8 percent dividend on the coal company's capital of $20,000,000. A check for $1,200,000, the rental for the past nine months on this basis, was handed over to the coal company. The directors of the steel company declared a dividend of 3½ percent on the preferred stock for the half year.

The ore unloading record has again been broken. At Conneaut, Sept. 11, the ore was removed from the steamer Jas. H. Hoyt. The Hullett clamshells loaded 107 cars in three hours and thirty minutes. It took the fast plant one hour and thirty-five minutes to remove the remaining eighteen cars, making the total time four hours and fifty-four minutes. Only four clamshells were used. One of the machines averaged a car every four minutes for the two hours. The Chicago machine made a test on the same vessel last week, removing the ore in five hours and forty-five minutes.

The new three story building erected by George W. Heartley in Toledo, will be ready for occupancy Oct. 20. Mr. Heartley manufactures presses, shearing and punching machinery.

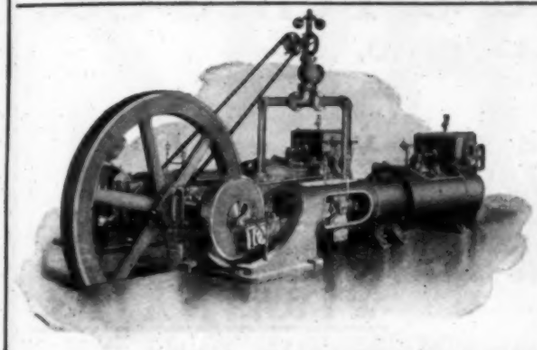
Cochrane Feed-Water Heaters and Purifiers.

EVEN though your main engines are run condensing, you will find it economical to install steam-driven auxiliaries and utilize the exhaust from them in a Cochrane Feed-Water Heater and Purifier. In this way you can obtain the means for heating your boiler feed to about 200 degrees. Running all condensing, you have to feed the boilers with water at about 100 degrees. The hotter feed obtained through the Cochrane Heater will cut down your fuel bills—think of that during a coal strike!—and eliminate contraction and expansion strains on the boilers. Besides, a "Cochrane" purifies the boiler feed to an extent that is not possible if the whole plant is run condensing.

HARRISON SAFETY BOILER WORKS

Clearfield and 17th Sts. PHILADELPHIA, PA.

SMITH-VAILE AIR COMPRESSORS



Are made of the Straight Line and Duplex types; Single and Multiple Stage Compression; Steam actuated with simple or compound Steam Cylinders, or belt driven, for operating Pneumatic Tools, Hoists, Mining Purposes, Pumping Water, Elevating Fluids, etc.

We also make Stilwell Feed-Water Heaters, Steam and Power Pumping Machinery, and the Victor Turbine Water Wheel. For prices, address,

The Stilwell-Bierce & Smith-Vaile Co., M. O. B. 227, DAYTON, OHIO.

TIN PLATES

Coke Charcoal Roofing

Galvanized and Black Sheets

The J M & L A OSBORN CO. CLEVELAND COLUMBUS

TOOL STEEL BALLS

We have the largest and best equipped ball making plant in the world. Regular stock sizes from 1-16 to 4 inches.
Write for catalogue.

FEDERAL MANUFACTURING CO.
CLEVELAND BALL FACTORY
CLEVELAND, OHIO.

DIAMOND MACHINERY CHAINS

Steel drive chains for power transmission—block, roller, cable or balancing, and tubular rivet chains.
Write for catalogue.

FEDERAL MANUFACTURING CO.
DIAMOND CHAIN FACTORY
INDIANAPOLIS, IND.

KOKOMO

LET US QUOTE YOU OUR PRICES ON Wire Nails, Coil Spring Wire, Standard and Special Brands of Barb Wire, Market Wire, Ornamental Fences, Window Guards, Bank and Office Railings.

A complete description of our products will be mailed upon request.

KOKOMO STEEL & WIRE CO.
OFFICE AND FACTORY, KOKOMO, IND.

The Cuyahoga Wire & Fence Co.,
CUYAHOGA FALLS, OHIO,
MANUFACTURERS OF
WIRE RODS.
Annealed and Galvanized Fence Wire, and Hartman Wire Fencing.
BRIGHT, TINNED AND COPPERED MARKET WIRE.
Tinned Mattress and Broom Wire.
Annealed Stone Wire.
Wire Straightened and Cut to Lengths. **WIRE NAILS.**
Works:—Cuyahoga Falls, Ohio. Newcastle, Penn.

WIRE DRAWING AND CHAIN MAKING MACHINERY.

Our line is complete and up to-date. Twenty-five years' experience has given us an intimate knowledge of what is needed and enabled us to build machinery whose records have never been equaled, not only in the past but at the present time. Why not investigate the matter and equip with money-making machinery? We want your order, either large or small.

THE TURNER, VAUGHN & TAYLOR CO., Cuyahoga Falls, Ohio.

The
Lorain Steel Company,

LORAIN, OHIO.

Rails, Blooms, Billets and Slabs.

American Steel & Wire Co.

CHICAGO NEW YORK WORCESTER DENVER SAN FRANCISCO

SPRINGS

WIRE OF EVERY DESCRIPTION—round, flat, square, triangular and odd-shaped. Music wire. Mattress, broom, weaving and market wires in all finishes. Special wires adapted to all purposes.

WIRE HOOPS for use on lime barrels, sugar, salt, produce, apple, cracker, cement and flour barrels and other slack cooperage.

ELECTRIC WIRES AND CABLES of all kinds, bare and insulated. Iron, aluminum and copper. Telegraph and telephone wire. Pole steps.

RAIL BONDS for electric railroads.

WIRE ROPE, heavy cables and hawsers. Elevator, tramway, dredging and derrick ropes, ships' rigging, extra flexible ropes, sash cord and clothes lines.

BALE TIES for baling hay, straw, flax and all kinds of fibrous materials; also for bundling lumber, mouldings, staves and heading.

BARBED WIRE, both two and four point; Glidden, Baker, Perfect, Ellwood Waukegan, Lyman and Iowa brands.

NAILS, STAPLES, SPIKES AND TACKS of all kinds. Standard wire nails in all sizes and shapes. Miscellaneous fine nails. Tacks in count and weight packages. Dowel pins. R. R. spikes.

WOVEN WIRE FENCING.

COPPERAS for chemicals, disinfectant, purification of gas, polishing, for wood preservative and for fertilizing.

VENETIAN RED AND OXIDES OF IRON for making bridge paint, car, roof and all outside paints, and for dyeing.

POULTRY NETTING galvanized before weaving. All meshes and sizes.

WIRE RODS of open hearth and Bessemer steel.

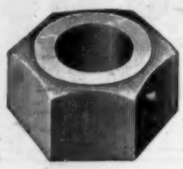
HORSE SHOES "Juniata" brand, iron or steel in all sizes and patterns. Also toe calks.

SHAFTING, COLD DRAWN STEEL free cutting screw steel. Roller bearing rods, rounds, squares, hexagons, flats and special shapes.

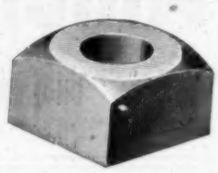
PLATES AND SHEETS of open hearth and Bessemer steel.

The Milton Manufacturing Co.,

MILTON, PA.



Manufacturers of **COLD PUNCHED NUTS**



HOT PRESSED NUTS, PLATE WASHERS, ETC.

Quality and Finish the Best. Send Specifications for Prices.

American Iron & Steel Mfg. Co.

General Offices at Lebanon, Pa., U. S. A.

MANUFACTURERS OF

Merchant Bar Iron and Steel

(Annual Capacity about 150,000 Tons)

Also Every Variety of

Machine Bolts, Nuts, Washers, Turnbuckles, Lag Screws, Railway and Dock Spikes, Harvey Grip and other Railway Track Bolts.

BOILER, SHIP AND STRUCTURAL RIVETS.

Car Forgings and Rods and Irons for Bridges, Buildings, Etc., Etc.

This Company owns and operates the works formerly owned by

J. H. STEINBERGH & SON, Reading, Pa. NATIONAL BOLT, NUT AND RIVET WORKS, Reading, Pa.
LEBANON IRON CO., Lebanon, Pa. EAST LEBANON IRON CO., Lebanon, Pa. PENNSYLVANIA BOLT AND NUT CO., Lebanon, Pa.

Finished, Case Hardened and Semi-finished Hexagon Nuts Threaded and Finished to Standard Gauge.

First Class in all respects.

THE UPSON NUT CO.,

CLEVELAND, OHIO.

When writing, refer to this advertisement.

REPUBLIC IRON & STEEL CO., CHICAGO, ILL.

BAR IRON BAR STEEL

Machine Bolts, Carriage Bolts, Gimlet Point Coach Screws, Turnbuckles.

NUTS. R. R. SPIKES. PIG IRON.

NEW YORK, CLEVELAND, BIRMINGHAM, PITTSBURG, BUFFALO, CINCINNATI, ST. PAUL, SAN FRANCISCO, ST. LOUIS, JOPLIN, MO., PORTLAND, ORE.